ONE DOLLAR PER COPY

the OIL AND GAS JOURNAL

PUBLISHED WEEKLY

OCT.
26
1959

Cal Research introduces:

ISOCRACKING

New process route to:

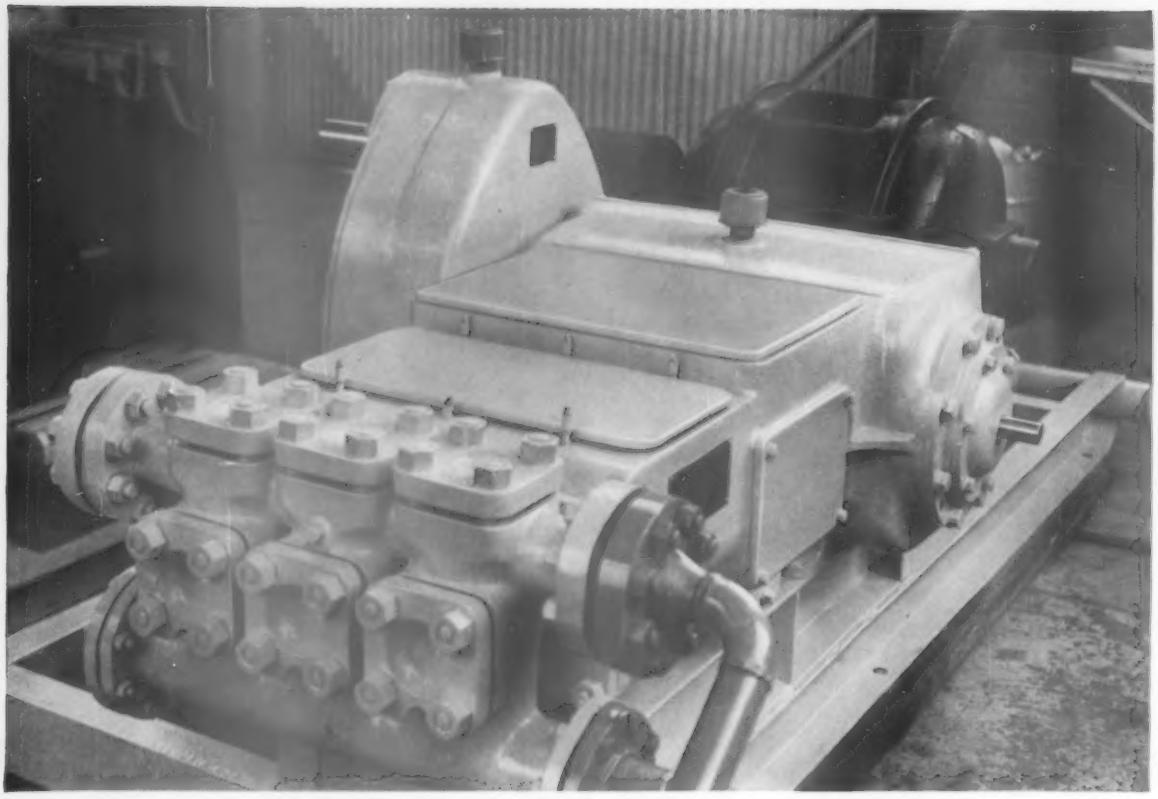
- **High road octanes**
- **Great yields from heavy cracked naphthas and refractory cycle stocks.**

p. 48

Russell Brown, an old hand at fighting the IPAA's battles in Washington, tells how oil can improve its relations in the nation's capital.

p. 43

MEROX: UOP's new low-cost method for treating sour gasolines and distillates p. 73



Timken® double-row tapered roller bearings keep pump working without watching

IT practically runs itself. That's why this new Triplex Pump does so well on toughest oil field and industrial pumping jobs. It has larger shaft diameters, crossheads and bushings than any in its class. And to keep it running at full load continuously without watching, the crankshaft is mounted on two Timken® double-row tapered roller bearings. The two-row bearings allow precise clearance adjustment and freedom from knock at load reversals. So many machine builders use Timken bearings because they:

1) *Keep shafts positively aligned . . .* minimize deflections and end play. And Timken bearings are *tapered* to take any combination of radial and thrust loads.

2) *Deliver more for the money.* Better engineering service from graduate *engineer* salesmen; greater bearing service because of unmatched research and testing facilities; higher quality because we use the highest bearing-quality alloy steel available. And that steel is nickel-rich for extra toughness.

For better machines, be sure the ones you build or buy are Timken-bearing-equipped. ***When you buy Timken bearings you get . . .*** *1) Quality you can take for granted. 2) Service you can't get anywhere else. 3) The best-known name in bearings. 4) The pace setter in lower bearing costs.* The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

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TIMKEN®

tapered roller bearings

OIL AND GAS JOURNAL
Vol. 57 No. 44

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Annual index available on request.

TECHNOLOGY—OPERATION

Pipelining

Variable-Speed Drive Cuts Power Costs 79

By E. C. Michels

The eddy-current drive transmits the rotation from constant-speed motor to centrifugal pump. Proved-in-operation advantages include short payout time, increased range of operations and increased capacities, and reduction in maintenance of pump and motor equipment.

Pipeline Construction Report 106

Drilling

What You Need for Effective Air Drilling 83

By F. W. Smith

The horsepower needed to keep the hole clean in air drilling depends on hole size, whether the hole is wet or dry, penetration rate, depth of hole, and cutting size, shape, and density. This article correlates these variables for more effective air drilling.

Production

Reservoir Engineering—15 87

By E. T. Guerrero and F. M. Stewart

How to determine effective permeability from multiphase pressure-buildup data under finite boundary conditions.

Free Piston Removes Accumulated Liquid from Gas Wells—2 93

By C. M. Beeson and D. G. Knox

Installation is low cost and requires little attention. The technique provides for less back pressure on the formation and prevents certain wells from making sand.

The Permeator: New Tool for Greater Oil Recovery 100

By R. W. Coburn

This field-proven method of well completion provides for casing perforations without damaging the field. Other advantages include no casing burrs, no junk in the hole, cement protection from acid attack, automatic casing centralization, machined seat for ball sealers, uniform diameter for perforations, and adaptability for multitubingless completions.

Refining-Processing

New Low-Cost Way to Treat High-Mercaptan Gasoline 73

By K. M. Brown, W. K. T. Gleim, and P. Urban

This new UOP Merox process economically treats gasolines not quite sour enough to justify a Unisol unit but which cannot be treated adequately by simple regenerative caustic washing. The process also provides an inexpensive means of treating jet fuels, kerosines, and other middle distillates.

Processing Costimating—59 98

Operating cost of gas-compressor stations.

Sun Installs Propylene Unit Tower 105

The 145-ft. tower which is the first section of a two-tower high-purity propylene plant was installed in only 75 minutes. Completed plant will furnish propylene for polymerization into polypropylene.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Oct. 26, 1959

Fourth-quarter prospects for oil are still good:

With careful management, the industry can enjoy respectable production and crude runs, yet still start 1960 in a good stock position.

The Journal economics department says here's what is needed:

An average drawdown of 534,000 bbl. daily in stocks.

Coupled with estimated total demand of 10,246,000 bbl. daily, this means crude production could rise to 7,162,000 bbl. daily and runs to 8,139,000.

Key to this achievement is cutting stocks.

And most needed stock change now is distillates.

Here's how changes can be accomplished in:

...Gasoline. These stocks totaled 176,000,000 bbl. at start of month. If net addition for fourth quarter can be held to 98,000 bbl. daily, stocks would be 185,000,000 bbl. at first of year. This would leave a little room for additions in first quarter of 1960 before motoring season.

...Kerosine. With stocks at 32,200,000 bbl. drawdown should average 57,000 bbl. daily this quarter to leave stock balance at 27,000,000 bbl. on January 1.

...Distillate. Total stocks should be down to about 141,000,000 bbl. by year's end. This means a 358,000-bbl. daily reduction this quarter. This would leave operators at least 60 million barrels to be used in addition to current production in 1960 first quarter.

...Residual. Stocks probably will not drop more than 92,000 bbl. daily this quarter. Even this assumes return to steel production in November and December.

...Other products. Normal reduction of about 98,000 bbl. daily includes a cut in stocks of unfinished oils and a drawdown on inventories of LPG.

...Crude. Only small reduction of 22,000 bbl. daily in crude stocks is expected. Big draw came in summer when refinery runs were abnormally high.

These operating levels would give stock reduction of

49,100,000 bbl. for the quarter or 534,000 bbl. daily and mean required supply of crude would average 9,712,000 bbl. daily.

The new supply needs will be met from:

...Imports of 1,670,000 bbl. daily, slightly higher than the third quarter. Marketers did not import full quotas of residual in the summer and will make this up in winter.

...Domestic production of about 8,042,000 bbl. daily. Gas-liquids output will be about 880,000 bbl. daily and crude production 7,162,000.

Forecasted balance sheet then (in 1,000 bbl. daily):

Domestic demand		10,010	Imports		
Export demand		236	Crude	1,000	
			Products	670	1,670
Total		10,246			
Stock change			Domestic output		
Crude	- 22		Crude	7,162	
Products	-512	-534	Gas liq.	880	8,042
Required supply		9,712	New Supply		9,712

The estimated refinery runs of 8,139,000 bbl. daily based on above set of statistics will be supplied like this: 7,162,000 bbl. daily crude production, plus 1,000,000 bbl. daily crude imports, plus 22,000 bbl. daily crude from stock, less 45,000 bbl. daily crude transfers, exports, and loss.

Anticipating possible alternate conditions, economists cover these situations:

...If total demand fails to reach expected rate.

Crude production could be reduced below 7,162,000-bbl. daily estimate, leaving still only 781,000,000 bbl. of crude and products in tanks at end of year.

...If demand does reach expected levels.

Any additional reduction in supply then would show up as lower stocks at year end. This wouldn't present any problem in meeting demand in first quarter of 1960. Possible exception is residual should an unusually cold winter hit the East Coast. Then import quotas could be stepped up to supply the fuel. For other needs, there is plenty of surplus refining capacity just waiting to be turned on.

...If total stocks are cut more than 49,000,000 bbl. in last quarter.

Most desirable reduction would be a slowdown in gasoline. This would leave distillate yields high during heating season and gasoline stocks reasonably low for start of 1960.

Refiners should welcome any change that would send them

into gasoline season without heavy price cuts caused by excessive inventories.

▼ ▼ ▼

Exploring in the Rockies: Wildcatting will pick up in southwestern Colorado's Paradox basin again. The Towaoc area in Montezuma County will be tested again by Pure and Big Horn-Powder River Corp....Important gas strike by El Paso Natural in Piceance Creek basin will encourage new tests...Williston drillers are closely watching Mobil's discovery in Sheridan County, Mont. It found good oil recovery in Mission Canyon formation but is still drilling below 8,773 ft. toward the Ordovician target at 12,000 ft.

▼ ▼ ▼

Air-turbine drills are expected to reach the market by the first of the year.

The devices correspond to the turbodrill for mud drilling but aren't actually turbines. They're air motors and their purpose is to rev up the bit for air drilling. Indications are they do just that.

One drilling firm teamed with a manufacturer a year ago to make a run with the air motor. It was a great success but doubts were held for its market potential.

The turbodrill is being mothballed by Dresser.

The tools will be available to anyone who wants them, but Dresser is just not pushing them—either by hard or soft sell.

Men working on the tool have been transferred to other jobs. They blamed failure to develop a proper bit for turbodrill's troubles. Other drilling experts, however, consider the high-speed approach simply wrong both theoretically as well as practically.

One interesting fact: The Mohole committee has asked AAODC-API turbodrilling committee to make recommendations about use of the drill in the Mohole.

▼ ▼ ▼

New isocracking process is making its bow to refiners.

Working on such charge stocks as coker distillate and refractory cycle oil, the process gives better than 100% yields of very high-octane gasoline components. Virtually no fuel gas is produced.

California Research Corp. developed the versatile new catalytic process (p. 48).

First commercial shipment of liquefied methane still may be more than 2 years off.

Ocean transportation of the product, however, has been proved in test runs from Louisiana to London (p. 52).

British plan to build two ships to carry liquid methane to Europe. Site of liquefaction plant has not been picked and it will take 2½ years after that to build the plant.

Decision to build the liquid-gas tankers practically kills chances for the trans-Mediterranean pipeline.

Refiners are taking a second look at benefits of using more tetraethyl lead in their gasolines.

Raising the limit recently from 3 to 4 ml. per gallon looks interesting for this reason: At the 99-101-RON level where additional numbers are hard to come by, 1 ml. of TEL will raise research octane 0.8 number, motor octane about 0.9-1.0 number and road octane--the real payoff--1.1 number.

New emphasis on paraffin-blending stocks will further improve TEL's economic advantage since its susceptibility is higher with this type of hydrocarbon.

▼ ▼ ▼

New pipeline linking Union-Ohio's Kenai gas field to Anchorage will be built soon in Alaska.

Anchorage Gas Corp., owned by group of Houston and Los Angeles business men, has franchise to serve Anchorage and is planning pipeline. Union-Ohio guarantees 30 million cubic feet of gas daily, 200 billion over period of 20 years (p. 55).

Work is starting on long delayed Transwestern line.

The $191-million gas system from West Texas to California has finally cleared red tape frustrations. The last hurdle was agreement of all producers to commit their gas ahead of FPC final determination of price (p. 56).

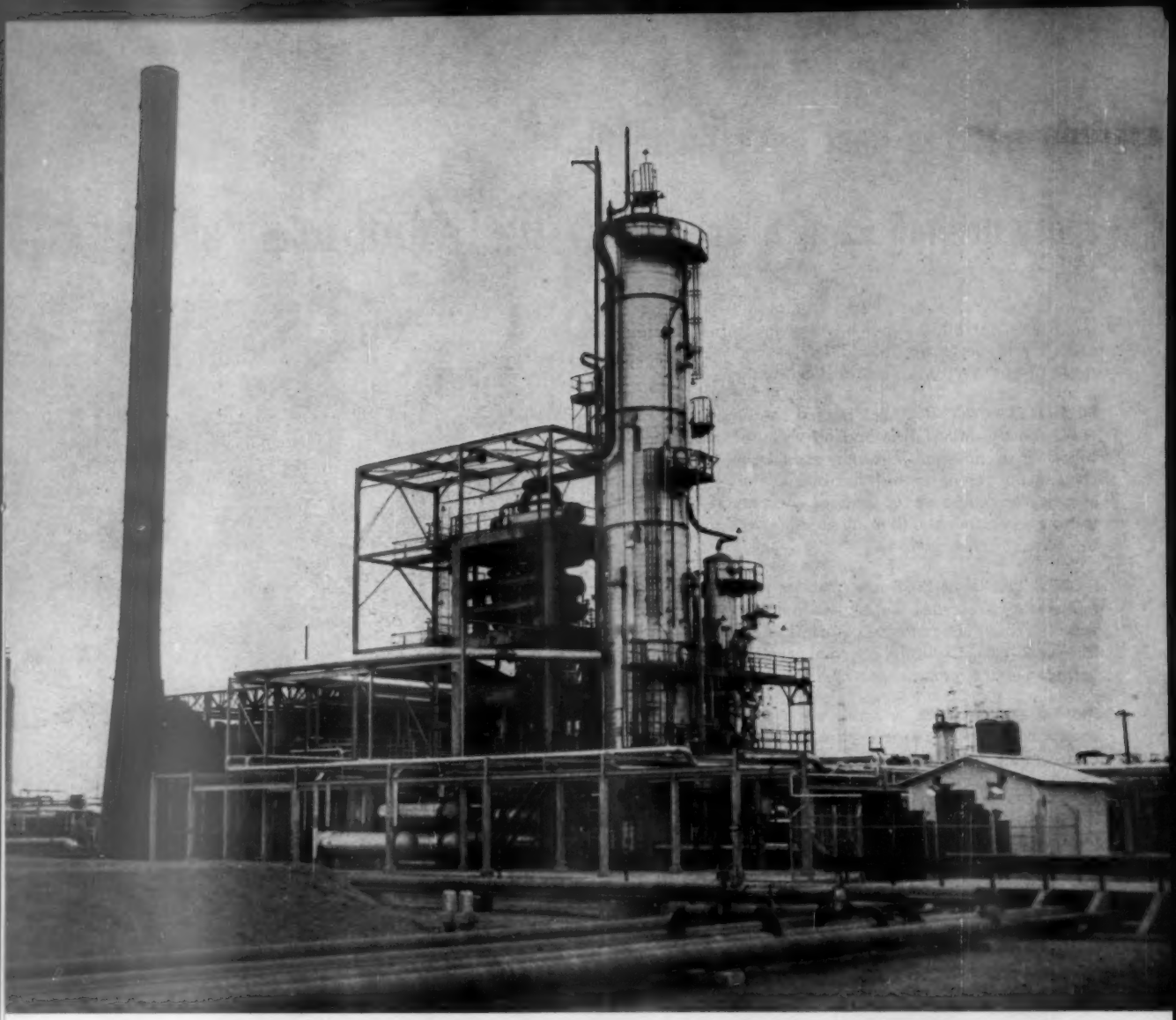
▼ ▼ ▼

Management items:

New Skelly president. Marketing Man Don H. Miller, and his new regime soft pedals revival of Skelly-Tidewater merger talk. Miller says his big job is to keep an aggressive company aggressive. Merger rumors, however, don't die easily. Marketing people see in Miller's rise a recognition of the important role marketing is assuming in the oil picture.

Ohio Oil intends to become an international company. President J. D. Donnell II tells New York analysts his company is seeking markets for its Libyan crude, has acquired leases in Australia, and is looking at Argentina and the Sahara.

Don't look for immediate increase in gas exports from Canada. Regardless of prompt action by FPC in Washington and Conservation board in Calgary, any export plans still must be approved by the new Canadian energy board.



HESS TRADING AND TRANSPORT UNIT COMPLETED IN SEVEN MONTHS FROM START OF ENGINEERING

A crude distillation unit and a complete utility system—the basis of a new refinery—has been designed, engineered and constructed by Lummus for Hess Trading and Transport, Inc., Port Reading, New Jersey, in exactly seven months.

Engineering was begun on April 1, 1958 and on November 1, 1958 the refinery was ready for operation. Twenty-one days after crude was charged, the performance tests for the unit were successfully completed and the unit has been operating at capacity on various charge stocks.

Lummus designed the unit to assure a general-purpose refinery which is capable of processing various types of crude.

In addition to the crude distillation unit, the off-site facilities include: a complete electrical system, a water cooling and circulation system, steam generation equipment, waste water system, TEL blending and dyeing system, instrument air, plant air, fuel gas, and fuel oil systems. All were designed by Lummus to allow for future expansion.

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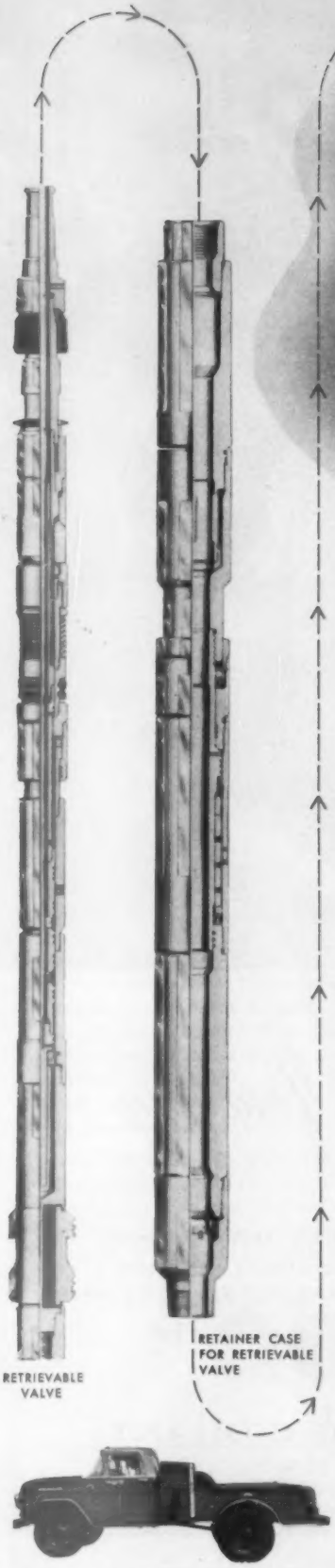

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Developed for use with Halliburton Retrievable Test-Treat-Squeeze (RTTS) Packer for a formation test to permit subsequent operations of treating, squeezing, perforating or further testing ... *with only one trip into the hole!*

The Retrievable Valve Tester is composed of two basic assemblies—The Retrievable Valve, for opening and closing positions for formation testing—The Retainer Case, to provide a seat for the Retrievable Valve.

Retainer Case is run in tubing above "RTTS" Packer and is an integral part of tubing string during all operations. Valve is operated by right hand tubing rotation when set in Retainer Case. Setting blocks lock the Valve in the Case preventing Valve from being forced up tubing from pressure below. Valve is released from Case by a 5-position sliding valve which is set in close position; and is removed by wire line or reversed circulation after test; leaving full opening through tubing string.

A pressure recorder attached to Valve and locked in place in Retainer Case before going in hole offers many operational benefits:

- Formation testing with complete closed-in-pressure
- Allows removal of Valve and pressure recording device to check bottom hole pressure ... without unseating packer
- Permits a continuous flow test
- Application of stimulation treatment
- Downhole operations can be repeated on multiple zones ... *with only one trip into hole*

RUNNING CASE WITH STRAINER FOR PRESSURE RECORDING GAUGE...

Serves as a protective case for running Pressure Recording Gauge with Retrievable Valve Tester. Attached to lower end of Valve, permits removal of Gauge with Valve for examination of pressure chart recordings immediately after test is completed.

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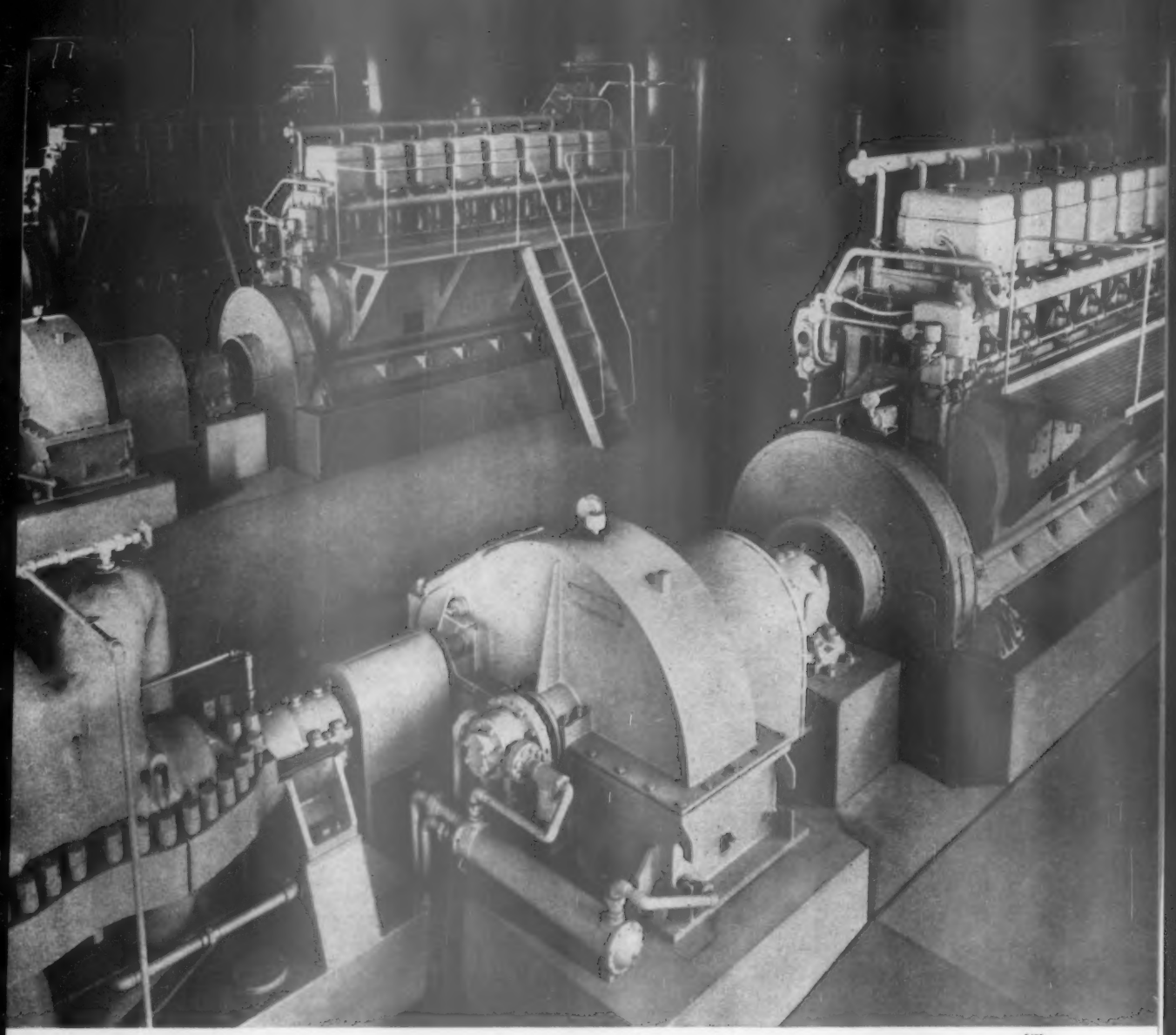

0459

Pipe line engines by Nordberg

Unattended, remote control operation of six Nordberg engine-pumping units is an important feature of the Evangeline Products Pipe Line System. Three Nordberg 1720 horsepower, four-cycle engines are installed in two identical, full satellite pumping stations on the 16-inch products line.

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B
C
D
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C Reinforcing plies of heavy fabric plus helix of round steel wire
D Oil-, age-, abrasion- and weather-resistant cover

Nearly three times the service—and still going strong!

Tankers are serviced very rapidly at this Texas dock. Standard operation is to load 138,000 barrels of gasoline in just 10 hours. Also standard is a test of the hose at periodic intervals to determine whether it can continue in service handling the highest test petroleum products or whether it should be relegated to low pressure, bunker or utility service.

Over eight years ago, the G.T.M.—Goodyear Technical Man—specified his Style WH Oil Suction and Discharge Hose for this service. At last report, this husky, 150-pound working pressure hose had repeatedly passed the high requirements of the exacting periodic tests and was well on its way toward delivering three times the expected service, handling gasoline, aviation gasoline, and solvents under high pressure.

If you're looking for the unusual in oil hose life, why not look up the G.T.M.? You'll find he carries a complete line of oil hose from which to specify the right types for your needs at lowest end cost. And he's readily available through your Goodyear Distributor or:

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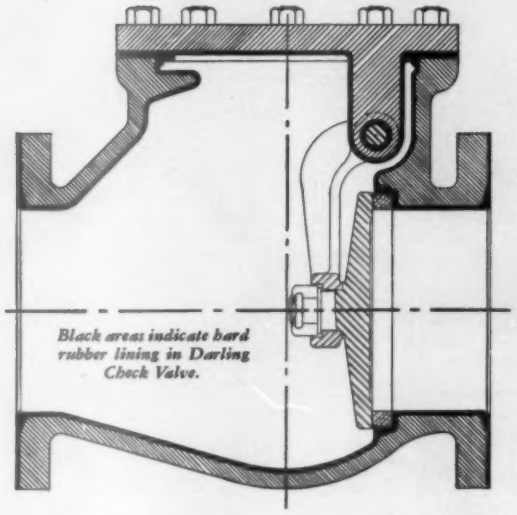
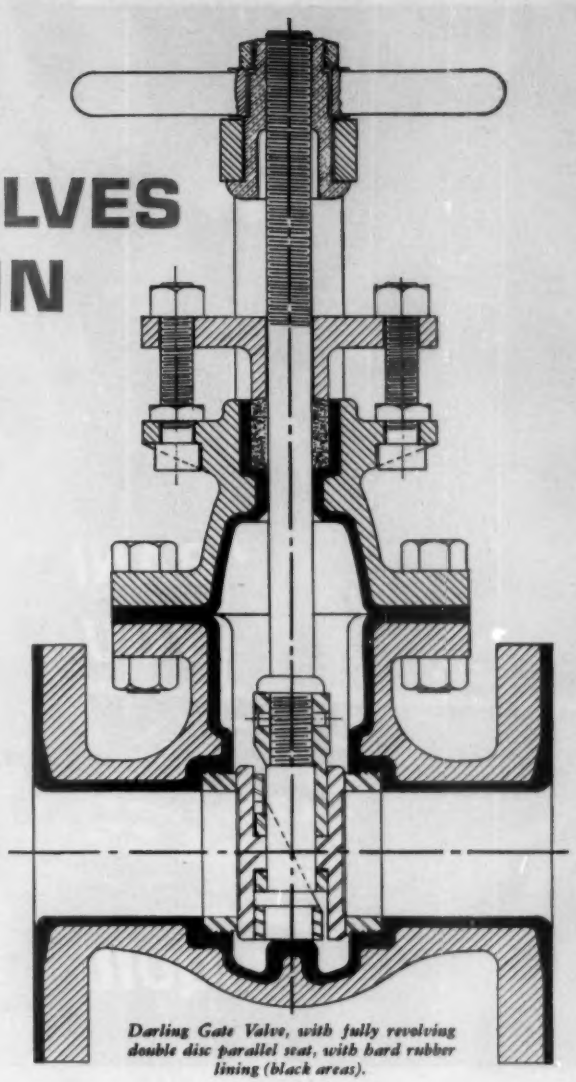


Black areas indicate hard rubber lining in Darling Check Valve.



Darling Gate Valve, with fully revolving double disc parallel seat, with hard rubber lining (black areas).

Rubber-Lined Check Valves...Gate Valves

Here's a way to make substantial savings in valves for corrosive or abrasive service. Darling Iron Body Check Valves and Gate Valves may be obtained with special hard rubber linings. This means you can often save the cost of expensive special alloy valves, yet obtain high resistance to corrosion or abrasion.

Darling Check Valves employ a streamlined body design especially selected for application of hard rubber lining. Excess area through the valve minimizes abrasion and insures full delivery of line capacity.

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DARLING VALVE & MANUFACTURING CO.

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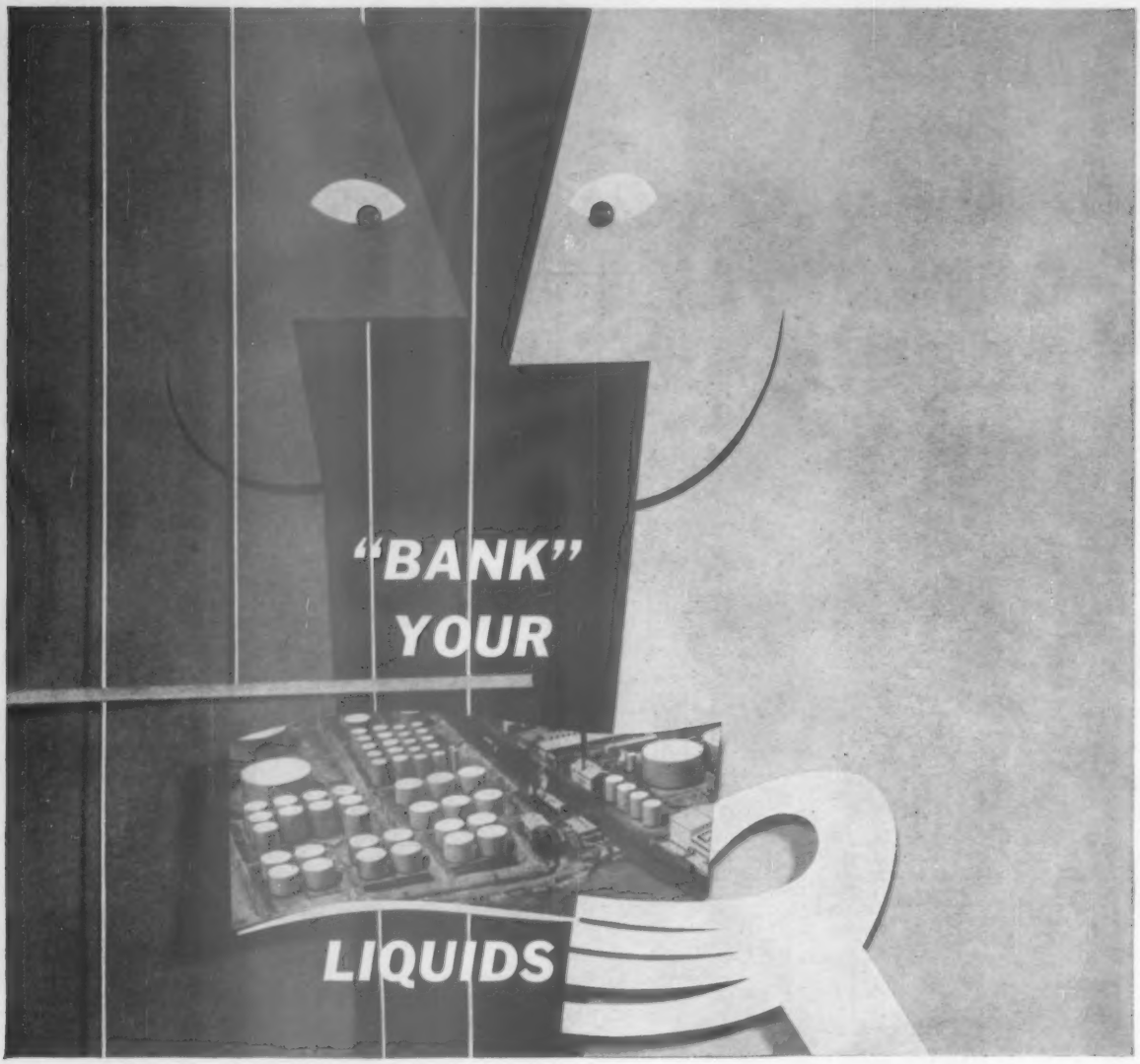
Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

DARLING VALVES



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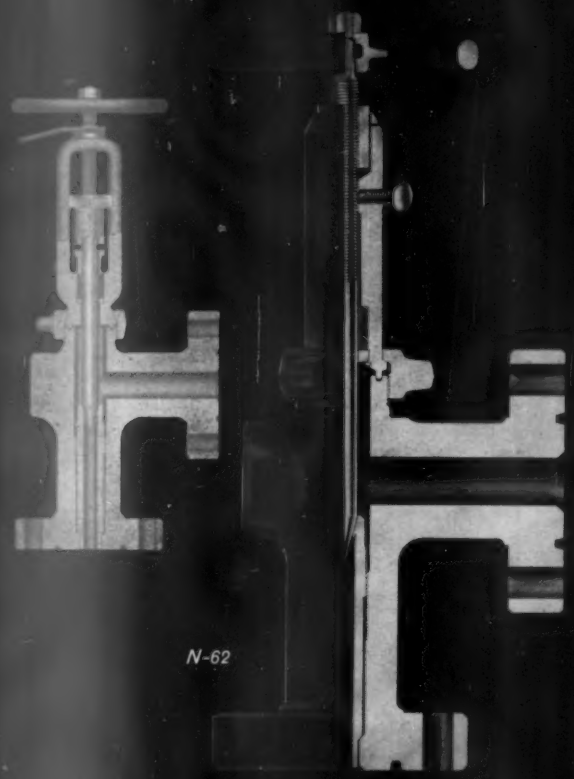


N-62

These are the characteristics that distinguish the new N-60 and N-62 adjustable chokes designed and produced by the Oil Center Tool Company.

Only a company with O-C-T's research in depth, its policy of staying abreast with oilfield needs, could improve on a good product—and that is exactly what was accomplished. The N-60 Threaded Adjustable Choke and N-62 Flanged Adjustable Choke replace O-C-T's time-tested Tee Type "N" and "N-2" Tee. The reason for replacement—a superior product.

The N-60 and N-62 are recommended for working pressures from 1500 to 5000 p.s.i.

On both flanged and threaded units, graduated indicators show the size of orifice in 64ths of an inch. Beans are quickly and easily changed. Proration tests can be made with both chokes by backing off yoke nuts and inserting proper size positive beans. All O-C-T wing nut connections have metal to metal and "O" ring seals.

The durable, compact and easily operated N-60 and N-62 Adjustable Chokes are available everywhere in supply stores. If you want additional information, check with an O-C-T representative. There is one near you.

where progress is a daily practice

O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to
P. O. Box 3091, Houston, Texas.

Rugged, Sensitive Temperature Transmitter

FOXBORO
TYPE 12A TEMPERATURE TRANSMITTER
SER
ADJUSTED RANGE
Measuring Spans
of 50°, 100°, 200°, 300°, and 400°F, are easily set as required within over-all transmitter range of —100°F to +1000°F.
Stable Operation
Single lever, single pivot, force-balance system provides stable, friction-free operation.
Fast Response
Highly sensitive, low-volume, gas-filled bulb and minimum length capillary assure maximum speed of response.
High Accuracy
Full compensation for ambient temperatures and pressures helps maintain highest calibrated accuracy.
Low Cost Installation
Standard 3-15 psi output signal requires only low cost tubing for transmission to any recorder or controller.

. . . IMPROVES REMOTE CONTROL

There's no easier, simpler way to measure remote temperatures, over so wide a range, with such high sustained accuracy and speed, and at so low a cost!

The Foxboro Type 12A Pneumatic Temperature Transmitter converts temperature measurement to a linear output signal, which is transmitted to any standard 3-15 psi recorder or controller. Fully compensated for ambient temperatures and pressures, this rugged, highly responsive instrument performs outstandingly under the most severe conditions. And it's insensitive to mechanical vibration.

The transmitter weighs only 7 pounds with its integral mounting bracket. It can be mounted anywhere . . . in any position . . . even directly on a bulb well! The gasketed, weatherproof housing permits installation in any location.

Write for Bulletin 13-17. It explains fully why the Type 12A Temperature Transmitter gives better performance with lower installation and maintenance. **The Foxboro Company, 6010 Neponset Avenue, Foxboro, Mass., U. S. A.**

FOXBORO
REG. U.S. PAT. OFF.

Pneumatic Temperature Transmission

Accident occurs . . .

Immediate first aid given . . .

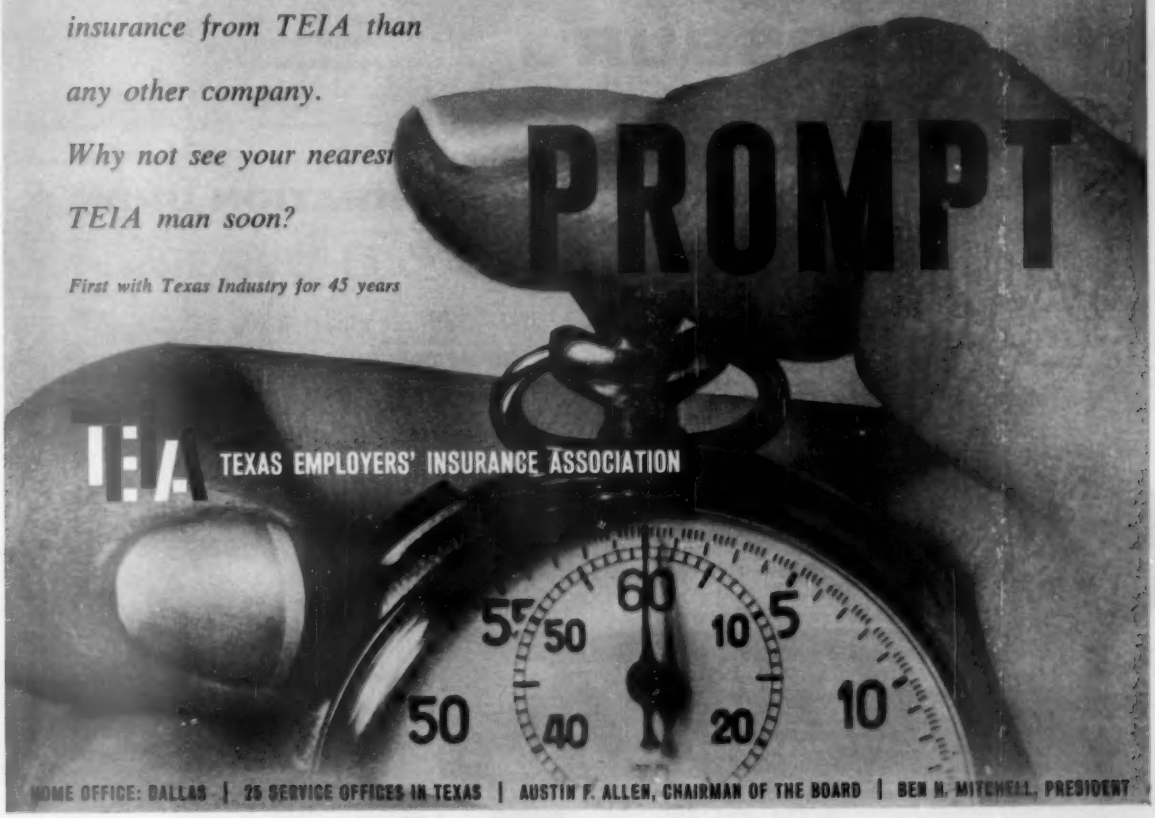
TEIA authorizes hospital and medical treatment . . .

TEIA begins payment of weekly benefits.

If you've bought your workmen's compensation insurance from TEIA, all of this is done promptly, efficiently. We believe that excellent claim service is a strong link in the chain of loyalty that links employer to employee. Most employers do, too; that's one of the reasons why employers in Texas buy more workmen's compensation insurance from TEIA than any other company. Why not see your nearest TEIA man soon?

First with Texas Industry for 45 years

PROMPT



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HOME OFFICE: DALLAS | 25 SERVICE OFFICES IN TEXAS | AUSTIN F. ALLEN, CHAIRMAN OF THE BOARD | BEN H. MITCHELL, PRESIDENT

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THE ORIGINAL COLD SEPARATION UNIT

with the exclusive T-Bone separator

The "Slim Jim" has proven itself the finest piece of oil-field equipment of its kind for low-temperature separation and the partial stabilization of the liquid recovered.

Because of its unique space-saving "slim" design, it is particularly suited for offshore operations.

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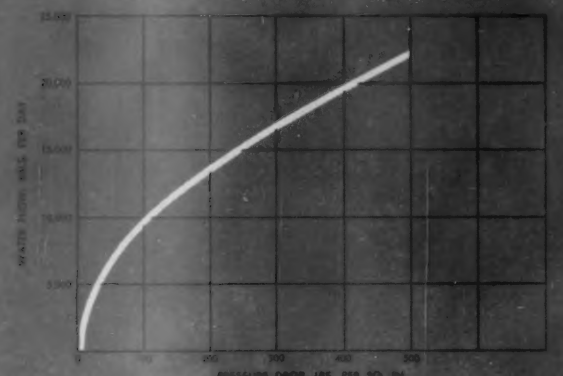
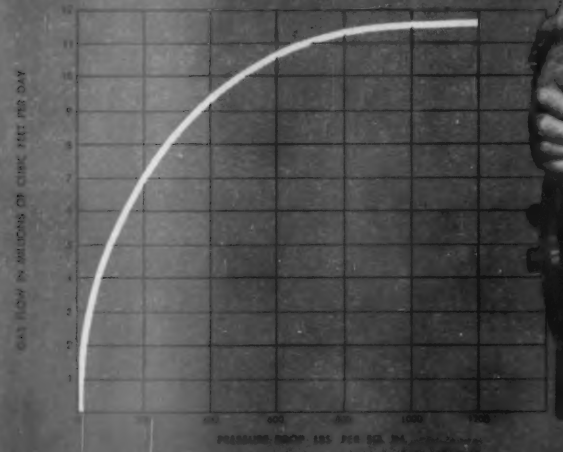
Flow area thru UNIBOLT ADJUSTABLE WING VALVE
Passes Large Quantities of Fluid or Gas



FLOW OF WATER THROUGH UNIBOLT CHOKE WITH 1" SEAT



FLOW OF GAS THROUGH UNIBOLT CHOKE WITH ½" SEAT AT 2000 PSI INLET PRESSURE

if you could produce 10,000 bbls. per well per day . . .

. . . as the charts show, this UNIBOLT Adjustable Wing Valve would handle the fluid with only a 100-lb. pressure drop! Or, you could produce 28 million cubic feet of gas through it with only a 200-lb. pressure drop. So, while the UNIBOLT Adjustable Wing Valve is not a full-opening type, its one-inch flow area is far more than adequate for practically any desired production rate—*and the cost is importantly lower than for conventional gate and plug valves.*

Actually, there's a dozen more good reasons why this UNIBOLT Adjustable Wing Valve is a solid favorite among value-conscious operators:

1. There are no exposed threads . . . no accidental damage.
2. All metal seats . . . not affected by high or low temperature.
3. Stem packing that needs no tightening.
4. Stem turns freely under high pressures.
5. Threads on stem not exposed to external or internal damage.
6. Full 2½" pilot for true stem alignment and rigidity.
7. Streamlined flow—no obstruction, no turbulence or impingement of flow, no negative pressure areas.
8. Requires no grease to effect a seal . . . may also be used as micrometer-gauged flow bean.
9. Variable choke speeds up initial clean-up or running initial flow tests . . . saves rig time.
10. Can be converted to "Pressurematic Safety Valve" by simply changing bonnet assemblies.
11. Valve can be completely overhauled without removal from tree.
12. Stem seat sealed by metal gasket; power threads assure alignment.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

Don't let rising process heats ruin your refractories

...or your profits... *mix imagination with Alcoa Aluminas*

The steady increase in general process temperatures poses no problem at all for refractories fortified with ALCOA® Aluminas. Their refractoriness rises in direct proportion to the amount of alumina in their composition. These high-purity aluminum oxides also add greatly to strength and stability under load at elevated temperatures. And high-alumina refractories are chemically stable, immune to both oxidizing and reducing atmospheres. They offer just one more illustration of the many good reasons why makers and users of a variety of products have found it pays to *mix imagination and engineering with Alcoa Aluminas . . . to make an old product better or a new product possible.* Discover what ALCOA Aluminas can do for your own product or process. Outline your requirements in a letter to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 709-K Alcoa Building, Pittsburgh 19, Pennsylvania.

For finer products . . . let Alcoa add new dimension to your creative thinking!

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For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

FOR TUBING PUMP VOLUME with ROD PUMP CONVENIENCE

Specify Continental-Emsco D+B Duplex Subsurface Pumps

Here's the extra volume you get with D+B Duplex Pumps

Duplex Pump Size	2" x 1½" x 1"*	2" x 1½" x 1-1/16"	2½" x 2" x 1¼"	3" x 2½" x 1½"
Plunger Constant	.408	.393	.762	1.21
Equiv. Plg. Diameter	1.88"	1.84"	2.56"	3.22"
Volume Increase:				
Rod Pump	56% over 2" x 1¼"	50% over 2" x 1½"	61% over 2½" x 2"	66% over 3" x 2½"
Tubing Pump	12½% over 2" x 1¼"	10% over 2" x 1¼"	27% over 2½" x 2¼"	37.4% over 3" x 2¾"

* Special middle seal

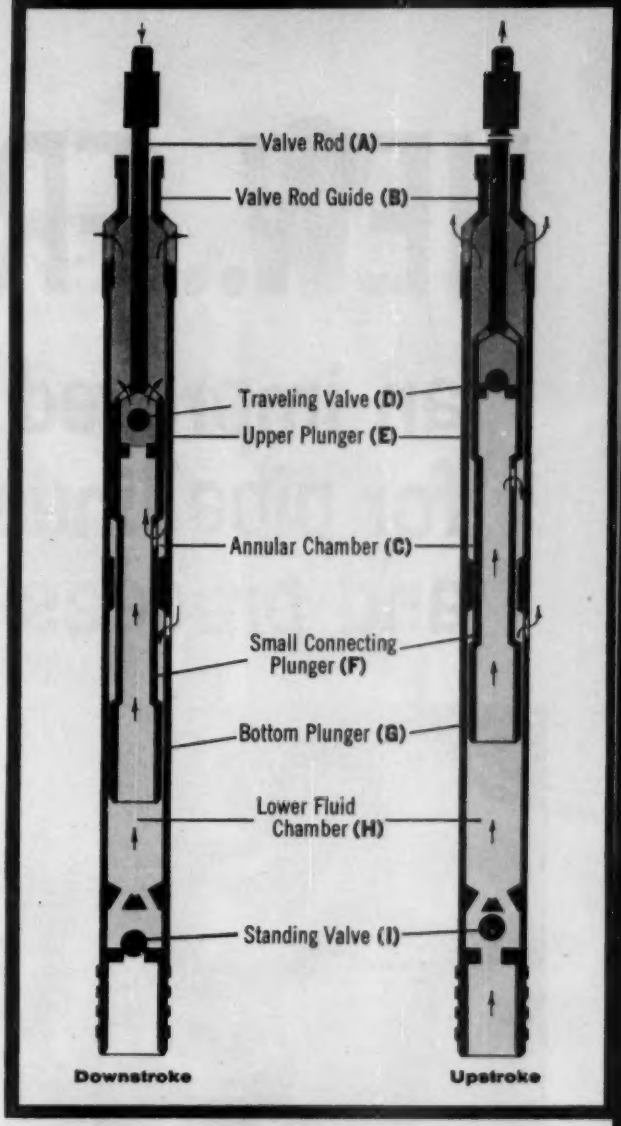
The greater volume and constant-flow design of D+B Duplex pumps give you these advantages:

CUT WELL MAINTENANCE: Greater fluid volume means: (1) slower pumping speed with less shock and wear on all equipment; (2) shorter stroke length to increase sucker rods pumping life for less wear on unit pumper's reduction gears.

INCREASED WELL EFFICIENCY: Constant fluid flow, 50% discharged on upstroke . . 50% on downstroke, reduces fluid friction through pump and keeps fluid moving up pump at all times so sand cannot settle . . prevents corrosive fluids from becoming dormant. Design reduces sucker rod buckling and provides longer plunger travel for maximum pump efficiency.

SOLVE GAS-LOCKING PROBLEMS: Traveling and standing valves can be spaced closer than on other double displacement pumps for higher pump efficiency under gaseous conditions.

ANSWERS WATERFLOODING VOLUME NEEDS: The greater volume helps to maintain tubing pump volume in waterflood areas without sacrificing the lower operational costs of a rod pump.



OPERATION: (50% of fluid is discharged on upstroke . . 50% on downstroke)

UPSTROKE: Fluid enters displacement chamber (H) through standing valve (I) and into chamber (C) between upper barrel tube and connecting plunger (F). Fluid above valve (D) is discharged into tubing through guide (B).

DOWNSTROKE: Fluid in chamber (C) is discharged into tubing through valve (D) and guide (B). Fluid fills approximately 50% of the void formed by the down- travel of [illegible] plunger (E). Perforations to equalize pressure across lower plunger are drilled into lower pin-type collar which connects liner column to lower barrel tube.

Operators can convert existing D + B pumps into high volume Duplex pumps using only [illegible] special parts. This [illegible] and makes a wide choice of materials [illegible] combat corrosion and abrasion.

For Service that Sings . . Equipment that Hums . . Go . .

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Serving the Oil and Gas Industries ... Worldwide

P304

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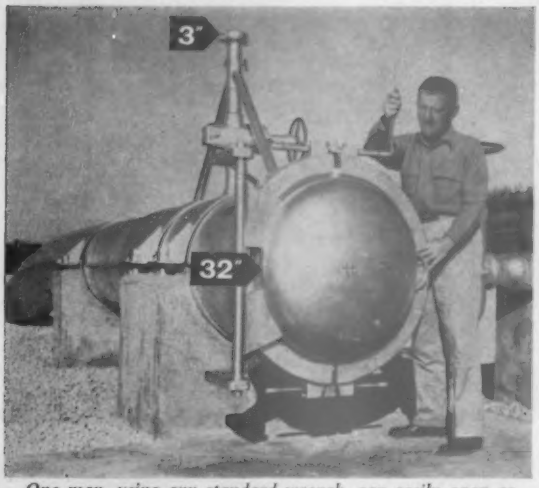
NEW...FROM TUBE

an improved hinged closure for pipe lines, piping and process equipment



One man, using any standard wrench, can easily open or close the TUBE-TURN *Hinged Closure. Has important safety features, too!*

For vertical applications, TUBE-TURN *Hinged Closures can be equipped with spring-loaded, counterbalanced caps.*

Tube Turns announces a new line of hinged closures with important advantages for pipe lines, piping and process equipment wherever frequent access is required or where the use of blind flanges would be cumbersome and time consuming. Proved in scores of applications by major companies, the unique TUBE-TURN* Hinged Closure provides these benefits:

Saves installation time. Light weight assembly easier to handle. Completely fabricated . . . ready to install. Requires only one butt-weld to join to pipe, tank or vessel opening.

Saves operating cost. One man, using a standard wrench, can easily open or close the largest size closure in a few minutes. No threads or lugs to engage or flanges to line up. No parts to fail. No hammering or tugging. Can be adapted to motorized operation. Closures for vertical applications can have counterbalanced caps for easy operation.

Saves on maintenance. Oil resistant, self-energizing static "O" ring provides seal. Does not move when cover is opened or closed. No rubbing or chafing to shorten seal life.

Built-in safety. Exclusive design features of two-piece yoke, double-ended right- and left-hand threaded bolts and hinged cap guard against accidental opening under pressure.

These new TUBE-TURN Hinged Closures provide still another *plus value* you can get when you specify TUBE-TURN products and buy them from your nearby Tube Turns' Distributor. They are available in sizes 2" through 42" for A.S.A. 150-lb, 300-lb and 600-lb service . . . in steel or alloys.

*"TUBE-TURN" and "tt" are trademarks of Tube Turns.

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FREE BULLETIN . . . Complete information on the new line of TUBE-TURN Hinged Closures will be sent on request. Mail coupon.

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Please send Bulletin TT956 on new TUBE-TURN Hinged Closures.

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DIVISION OF CHEMETRON CORPORATION
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H. L. "Jelly" Ellis, West-Texas District Manager, invites you to visit with him and REPUBLIC at your first opportunity in the all NEW Republic Supply store building in ODESSA, TEXAS. Our new TRUSCON* building is located at the same convenient location as the old building . . . 200 West FIRST Street.

This new Odessa store and sales office is just one of the modern facilities and services of Republic Supply designed to better serve you in the oil and gas industry. New facilities, combined with long-proven, experienced men like "Jelly" Ellis, assure you of the best equipment, supplies and service available.

**TRUSCON—Buildings by Republic Steel*

REPUBLIC SUPPLY COMPANY

Republic Supply COMPANY

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REPUBLIC STEEL

GOOD TIME TO TRIM FAT

from needless caustic soda costs!

Columbia-Southern's experience in manufacturing and selling quality caustic soda convinces us that many caustic users can effect appreciable savings on their current costs. Isn't this the ideal time to see if this applies to your caustic consumption?

Let's take the *form* of caustic you are buying and handling. Are you quite sure that new or projected changes in your products or processing won't be benefited by purchasing liquid, rather than anhydrous? Or vice versa? Or 73% liquid, rather than 50%? Do you have reliable figures on diluting and storing the stronger concentration? How about the facts on completely up-to date unloading techniques and equipment?

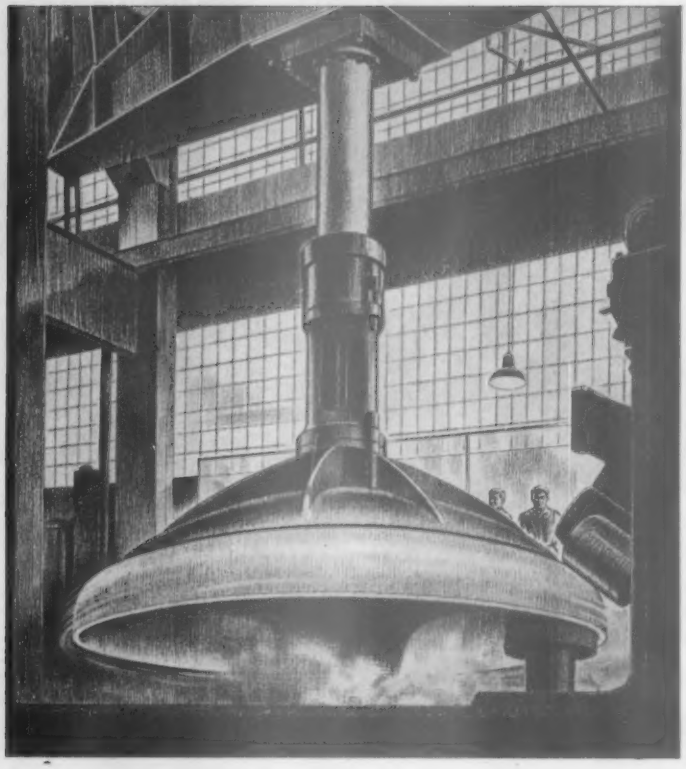
How about the uniform *quality* of the caustic you are receiving? Here again, Columbia-Southern can advise you with the authority of recognized experience. As a matter of record, we have led in developing improved tank car linings, heating, insulation, and safety features . . . patented unloading and dilution processes . . . economical waterways delivery.

Our well-grounded Technical Service engineers have helped customers save thousands of dollars in buying and using caustic soda. Isn't it good business, especially *now*, to see what savings they might work out for you? You may request their services either through our Pittsburgh address, or any of the fourteen Columbia-Southern District Sales Offices.

The Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania. Offices in principal cities. In Canada: Standard Chemical Limited.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION A Subsidiary of Pittsburgh Plate Glass Company

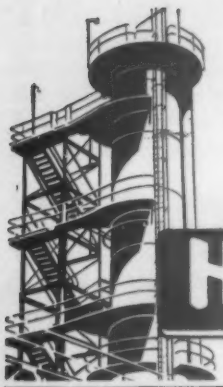
Spinning saves Metal —cuts tool costs



Dished and flanged ends Rotarpress spun by Harveys greatly facilitate the design and production of Pressure Vessels of all kinds. These ends combine semi-ellipsoidal form with large knuckle radius, allowing a substantial reduction in plate thickness to be effected, and in most cases the preparation and cost of expensive tools is eliminated.

'ROTARPREST' ENDS FOR PRESSURE VESSELS

can be supplied in Mild, Alloy and Clad Steels and non-ferrous metals. The capacity of the Rotarpress ranges from 5 ft. to 15 ft. diameter and from ⅜ in. to 4 in. thickness; knuckle radii may be varied to meet individual requirements.



GET THE FACTS!

Our latest catalog gives details of the diameters and profiles to which 'Rotarprest' Ends can be produced, along with a table of tolerances and notes on the calculation of plate sizes for alternative flange depths. Send for Catalog No. OG 965.

Harvey

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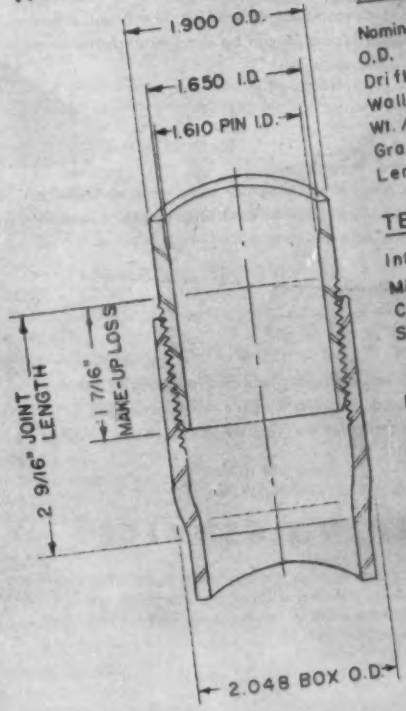
WOOLWICH ROAD, LONDON, S.E.7. ENGLAND
Cables: 'Cheaper, London.'

SPECIALISTS IN THE PRODUCTION OF DISHED AND FLANGED ENDS FOR THE PETROLEUM INDUSTRY.

10/15/59

MEMO TO: Field Superintendent—
This could mean big savings
on our dual completions
and slim hole program.
Suggest you look into it.
J.C.C.

1 1/2" x .125 WALL TEX-TUBE INTEGRAL JOINT OIL WELL TUBING



SPECIFICATIONS

Nominal size	1 1/2"
O.D.	1.900"
Drift I.D.	1.556"
Wall	.125"
Wt. / ft.	2.40 lbs.
Grade	J-55
Length	Rg. 2

TECHNICAL INFORMATION

Internal Press.- min.Yield	6,330 PSI
Mill Test	3,000 PSI
Collapse Press.	5,787 PSI
Setting Depths: (feet)	
Collapse s.f. 1.125	10,280
Tension s.f. 1.8	7,100

1 1/2"- 10 Rd. Reg. Thrd. Interchangeable with 1 1/2" A.P.I. Non-Upset Tubing

CONSUMER PRICES f.o.b. Houston, Texas

Carload	$ 50.13
Less than carload	$ 55.44

POWER TIGHT MAKE-UP AT 1/2 THREADS – TOLERANCE ± 1 1/2 THREADS 350-450 FT. LBS.

1 1/2" SERIES 301 X .125 Wall Integral Jt.

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SHEET 1 OF 1 SHEETS		

A Condenser Tube for Every Job

PRIME SURFACE TUBE

Wolverine keeps in step with processors' demands—not only with Wolverine Trufin® Type S/T, but with additional types of condenser tubing. From this complete line you can specify exactly the tube you need to meet your particular demands. Into each of these products goes all the research, the engineering skill and Tubemanship, that has made Wolverine a leader for more than 40 years. Your tubing dollars develop real stretchability!

PRIME SURFACE TUBE

Wolverine manufactures prime surface tubing in copper, copper alloys and aluminum—all quality controlled.

Duplex PRIME SURFACE TUBE

Here's a tube designed to handle two types of corrosive attack simultaneously. It is composed of a tube of one metal and a liner of another. The combination can be any alloy you need to meet special conditions.

DUPLEX PRIME SURFACE TUBE

Duplex TYPE S/T

This tube also is designed for specific corrosive conditions. But, like Trufin, it has integral fins—will boost heat transfer efficiency. It can be used instead of prime surface tube.

TRUFIN TYPE L/C

A high-finned, lightweight aluminum tube is mechanically bonded to an interior liner of the alloy which best beats your corrosion hazard. It provides maximum heat transfer and trouble-free performance at low cost.

DUPLEX TYPE S/T

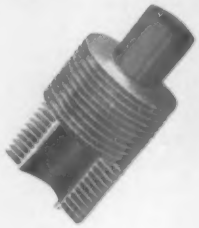
U-BEND PALLETS

This Wolverine idea cuts time, reduces storage problems, and saves money. U-bend condenser tubes—either finned or prime surface—are arranged in a disposable box-type pallet in the exact order you specify. All you have to do is feed them directly from pallet to unit.

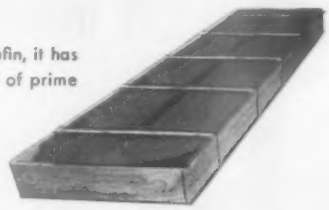
FIELD ENGINEERING SERVICE

This is a Wolverine "extra"—a staff of highly-skilled tubing technicians. You can get experienced help in solving problems dealing with alloys, corrosion, design or fabrication. You'll find complete information in Wolverine's Trufin Catalog. Send for your copy now.

TRUFIN TYPE L/C



U-BEND PALLETS



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They Say—

Stir frequently

Dear Sir:

Your article, "What's Happened to Our Thinkers," (OGJ, Oct. 12, p. 225) is meant to stir geologists up to think of new methods for finding oil. Personally, I think geologists need to be stirred up frequently.

I think the geologist has all the tools for finding oil that he needs if he will just use them. It all begins with scratching the surface for every last bit of evidence.

Whoever took that picture of your Paul Swain standing on the Gach Saran anticline in Iran (Oct. 12, p. 104) has a keen sense of surface geology. We learned years ago that each period of folding follows old lines of weakness. So our surface Permian anticlines in southern Oklahoma and North Texas give us clues to more intense folds and faults below. And this is true all over the world.

But, after all, what credit does any geologist deserve for finding a field. They'll all be found sooner or later if we have to dig a hole in every quarter section. Where the geologist needs to put in more intensive thinking is in getting more oil out of the reservoirs.

Of late years he has been turning more and more of this sort of study over to his engineers, who lack the background to really get the job done. The reservoir geologist is becoming fewer and fewer in number. After he has discovered the well, got it completed and going into the tanks, he seems to forget about it.

Down here in these thick sands of southern Oklahoma there are many cases where but 10% of the oil is recovered by primary methods. Our new discoverable reserves lie in that other 90%.

Frank Gouin
Geologist
Duncan, Okla.

Slow, painful cure

"There are far too many rigs in relation to the reduced volume of drilling activity. Consequently, too many rigs are idle too much of the time. Furthermore, those rigs at work are working at prices far too low due to unusually stiff competition for a share of the available business.

"Present conditions provide little hope for an early major advance in

Which is the Western Hemisphere?

Can you tell the real thing when you see it?

You can be sure of getting the genuine article every time when you buy chemicals made by Wyandotte! Product line of uniform quality, including materials for drilling muds, gas dehumidification, demulsifying, emulsifying, secondary recovery, water treatment, cementing, sweetening and many other petroleum, refinery, and petrochemical applications. Get full details from your distributor, or write: *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also, Baton Rouge, Louisiana. Offices in principal cities.*

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U. S. drilling rates. Economic ills in the producing branch of the industry must be corrected before gains in drilling are likely to amount to more than modest, gradual advances.

"The only other way to bring the supply of rigs into balance with requirements is through rig attrition. With so many rigs idle so much of the time, equipment wears out at an extremely slow pace. Therefore, rig attrition is not only a very painful cure but an extremely slow cure."

Warren L. Baker, executive vice president, American Association of Oilwell Drilling Contractors, in a speech at the AAODC annual meeting, Oklahoma City.

Gallon greedy

"Greed for the extra gallon of sales is killing us all. Sooner or later the facts of economic life are bound to catch up with those who try playing fast and loose with the laws of profit and loss.

"Sooner or later the price wars have to grind to a stop because those who are waging them wear themselves out under the battering of constant losses."

Dwight F. Benton, sales vice president, Standard Oil Co. (Ind.), in a speech to the Colorado Petroleum Marketers Association.

Matter of survival

"Nowadays, too many unions are trying to sabotage management's responsibility to manage efficiently. In the name of a security that is largely fictitious, they are doing their utmost to destroy the only real security, which lies in constant progress.

"Look at the steel strike, the dock workers' strike, the copper strike, the impending labor negotiations of the railroads . . . the strike that has shut down my own company's refinery at Sugar Creek.

"What these situations have in common is simply this: In each case management has insisted that it must, in the public interest, have the responsibility to manage for improved efficiency. In each case labor has insisted that it will not give any practical recognition to that responsibility.

"There is no point in trying to say that management carries no burden of blame for creating the situation that has precipitated these showdowns. Lulled by a continuing increase in the general level of prosperity since World War II, management went along with many practices that it knew were inefficient. . . . It seemed simpler, better not to make an issue of things that could be postponed.

"But now the impact of relentlessly

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- Allows multiple strings of tubing to be run simultaneously
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With the development of this equipment, Brown Oil Tools remains "OUT FRONT" in well completion tools and services.

You can benefit by insisting on "Brown Multiple-String Slips and Elevators" and experienced Brown Service Crews for your next well completion. Call Brown Oil Tools, Service Division. They are located near you.

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Efficient VAPOR TRAPPING...

a "built-in" feature of HORTON® FLOATING ROOFS for over 35 years

THE HORTON DOUBLE-DECK FLOATING ROOF has a double deck over the entire liquid surface. The top deck is pitched downward toward the center and the bottom deck is coned upward slightly. It is here that vapor is trapped, should some boiling of the product occur.

THE HORTON PONTOON FLOATING ROOF has an annular pontoon around the outer edge of the roof and a deck of single thickness at the center. The top of the pontoon ring is sloped downward toward the center of the roof and the bottom is pitched upward toward the center of the tank.

Two tanks with Horton Double-Deck Floating Roofs, serving a refinery in the Pacific Northwest. Tanks have a capacity of 80,000 barrels each.

Prime reason for equipping flat-bottom storage tanks with floating roofs is to prevent the loss of valuable volatiles through evaporation. Efficient vapor trapping is essential to this prevention.

Under normal conditions, product vapors are present in most tanks . . . and especially so during high temperatures. *But there is no need for loss of these valuable vapors.* The Horton Floating Roof is *designed* to trap and store them—in its "built-in" insulating space—until the vapors return to liquid state in cooler temperatures. The result: *maximum protection against costly evaporation loss and deterioration of product.*

Vapor trapping is just one of the many money-saving features that have made Horton Floating Roofs your best buy for over 35 years. Write today for the complete story.

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rising costs is full upon management. It has become urgently clear that we must make the fullest possible use of improved technology if we're to survive. Facts—and only facts—have forced many managements in many industries to take a new, hard look at past practices. They have come, each on his own, to the inescapable conclusion that inefficient practices can no longer be tolerated.

"If management surrenders its responsibility to manage, labor all too soon will lose its right to work. If we forfeit enterprise in an effort to hold on to the illusion of security, we'll lose enterprise and security alike. Industry's very survival is at stake, for it has been amply proved by now that business can carry corporate fat only at the risk of a corporate coronary."

John E. Swearingen, Standard Oil Co. (Ind.), in a speech to the Oil Men's Club of Kansas City.

Foreign oil in Canada

"Some of the larger companies find it more advantageous to refine oil produced by affiliate companies than to use crude from western Canada where production is limited to market demand.

"For this reason, oil from foreign sources is sometimes used at points such as Toronto and Puget Sound when Canadian oil theoretically would be just as cheap."

E. C. Babson, manager, Union Oil Co. of California, in a speech to a Saskatchewan petroleum symposium sponsored by Canadian Petroleum Association.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

OCTOBER

27 American Institute of Chemical Engineers, New York section, technical symposium, Hotel New Yorker, New York.

28-29 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28-29 Armour Research Foundation of Illinois Institute of Technology, annual computer applications symposium, Morrison Hotel, Chicago.

28-30 Society of Automotive Engineers, fuels and lubricants meeting, La Salle Hotel, Chicago.

28-30 American Association of Petroleum Geologists, Mid-Continent regional meeting, Broadview Hotel, Wichita.

29-30 Oil Recovery Symposium on South-

NEW Coffing SEALED Safety Pull Ratchet Lever Hoist

Here is a new hoist designed for safe, efficient hoisting in any weather. Loads will not slip because the brake mechanism of the Safety Pull Hoist is permanently sealed in five places against moisture, oils, chemicals and dirt—all common causes of hoist slippage.

The spring-loaded Neoprene seals assure that brake performance will remain constant under all exposure conditions. Another advantage of the sealed brake is that it will not freeze or lock—is always free to lower even after accidental overload.

Safety features include the exclusive Safety Handle which bends to indicate overload. The free chain control is protected so that it will not accidentally trip.

The Safety Pull Hoist is easy to operate. The handle pull to lift rated load requires minimum effort. Load spotting is precise to within a fraction of an inch. Up and down controls are away from operator's hand so he can use shorter leverage for greater speed with light loads. Ball bearing swivel load hook and plated chain are additional features.

Five models, ¾, 1½, 3, 4½ and 6-ton capacities are available. For additional information see your favorite supply store or write for Bulletin ADH-78.

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Ratchet Lever • Air
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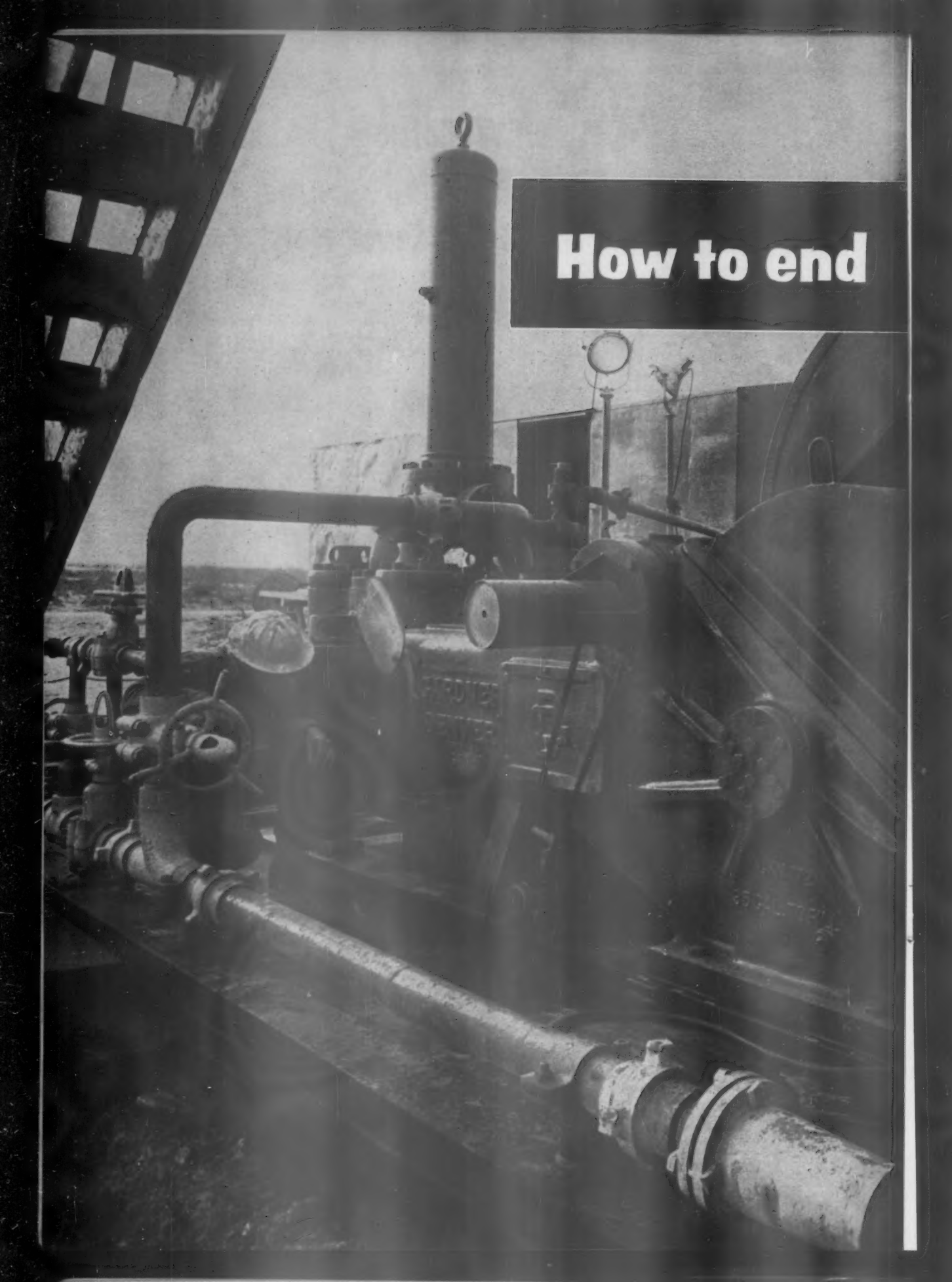
How to end

Mud-Pump Headaches

Gardner-Denver Mud Pumps have the power, the flexibility and the **dependability** to keep a well under control. They give you a real whip hand over formation pressures and circulation problems. Their reputation as **quality leaders** is unchallenged.

All parts replacements can be made in the field. The right- and left-hand cylinders in the famous **Gardner-Denver** fluid end are interchangeable. Pressure lubrication is provided in the power end. The packed oil stop head keeps oil in, mud out. One-piece connecting rods . . . no bolts to work loose. Parts are available through your nearby J&L Supply store.

Five GX models, 350, 500, 700, 1000 and 1250 h.p. Ask your local J&L Supply man for illustrated **Gardner-Denver** literature or write us at Tulsa—Drawer 2481.

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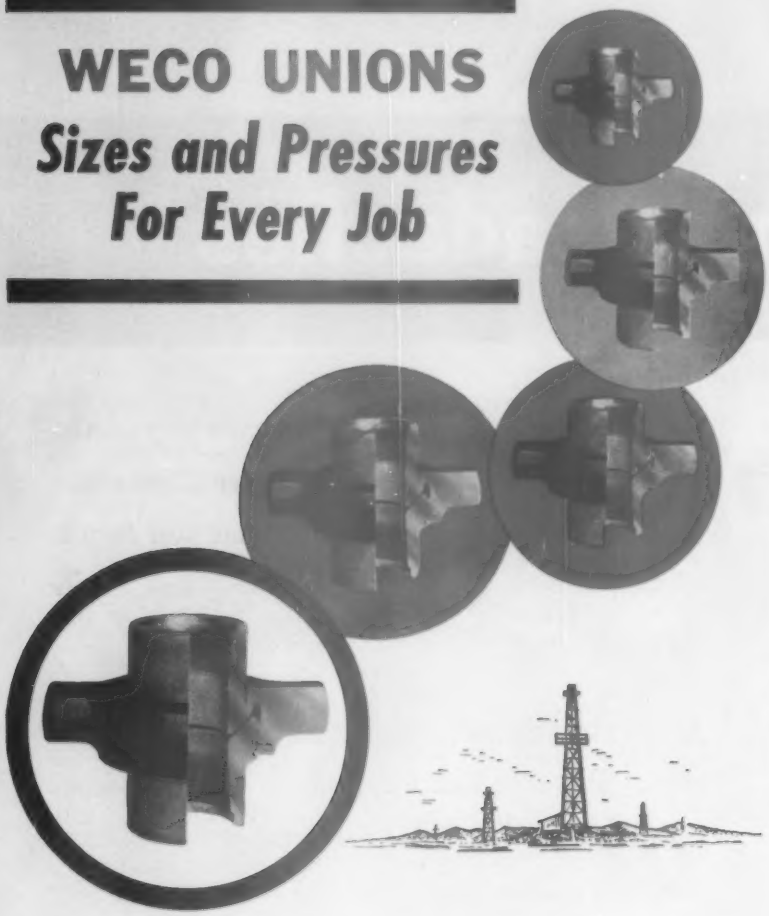
It's the best available

59

WECO UNIONS
Sizes and Pressures For Every Job



1" through 12" sizes of WECO Full Circle Contact Unions meet every union need in the oil industry with perfect sealing, high performance service.

Soundly engineered with a positive sealing ball and cone seat, the components of WECO Unions are correctly proportioned to provide maximum strength and union stability in every size.

WECO Unions have pressure ranges from 1,000 psi through 15,000 psi and are available from your nearest supply store.

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HOUSTON, TEXAS

WECO — Division of CHIKSAN COMPANY a subsidiary of FOOD MACHINERY AND CHEMICAL CORPORATION — fmc

west Texas, sponsored by southwest section of AIME and Texas Petroleum Research Committee, Driscoll Hotel, Corpus Christi, Tex.

NOVEMBER

1-2 Western Petroleum Refiners Association, second computer conference, Hotel Tulsa, Tulsa.

2-4 Geological Society of America, annual meeting, Penn-Sheraton Hotel, Pittsburgh, Pa.

4-6 Rocky Mountain Oil and Gas Association, fourteenth annual convention, Brown Palace Tower, Denver.

4-6 Institute of Radio Engineers, national automatic control conference, Sheraton Hotel, Dallas.

9-10 National Academy of Sciences-National Research Conference, first international symposium on fire research, National Academy of Sciences, Washington.

9-11 American Petroleum Institute, thirty-ninth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

9-12 Society of Exploration Geophysicists, twenty-ninth annual meeting, Biltmore Hotel, Los Angeles.

11-13 Gulf Coast Association of Geological Societies, ninth annual meeting, Shamrock Hilton Hotel, Houston.

12-13 American Association of Petroleum Geologists, Society of Exploration Geophysicists, Society of Economic Paleontologists and Mineralogists, Pacific section, thirty-sixth annual joint meeting, Biltmore Hotel, Los Angeles.

14-15 Gulf Coast Association of Geological Societies and Gulf Coast section, Society of Economic Paleontologists and Mineralogists, joint annual field trip, Galveston, Tex., to Cameron, La.

16-20 Fifth International Automation Congress and Exposition, New York Trade Show building, New York.

17-18 Natural Gas Pipe Line Institute, new Seward County Courhouse, Liberal, Kans.

19 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

20 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

20 Appalachian Geological Society, technical meeting, Charleston, W. Va.

22-29 Third Venezuelan Geological Congress, sponsored by Venezuelan Society of Geologists and Venezuelan Ministry of Mines and Hydrocarbons, Caracas.

29-Dec. 4 American Society of Mechanical Engineers, annual meeting, Chalfonte Haddon Hall, Atlantic City, N. J.

DECEMBER

3-5 American Chemical Society, southwest regional meeting, Baton Rouge, La.

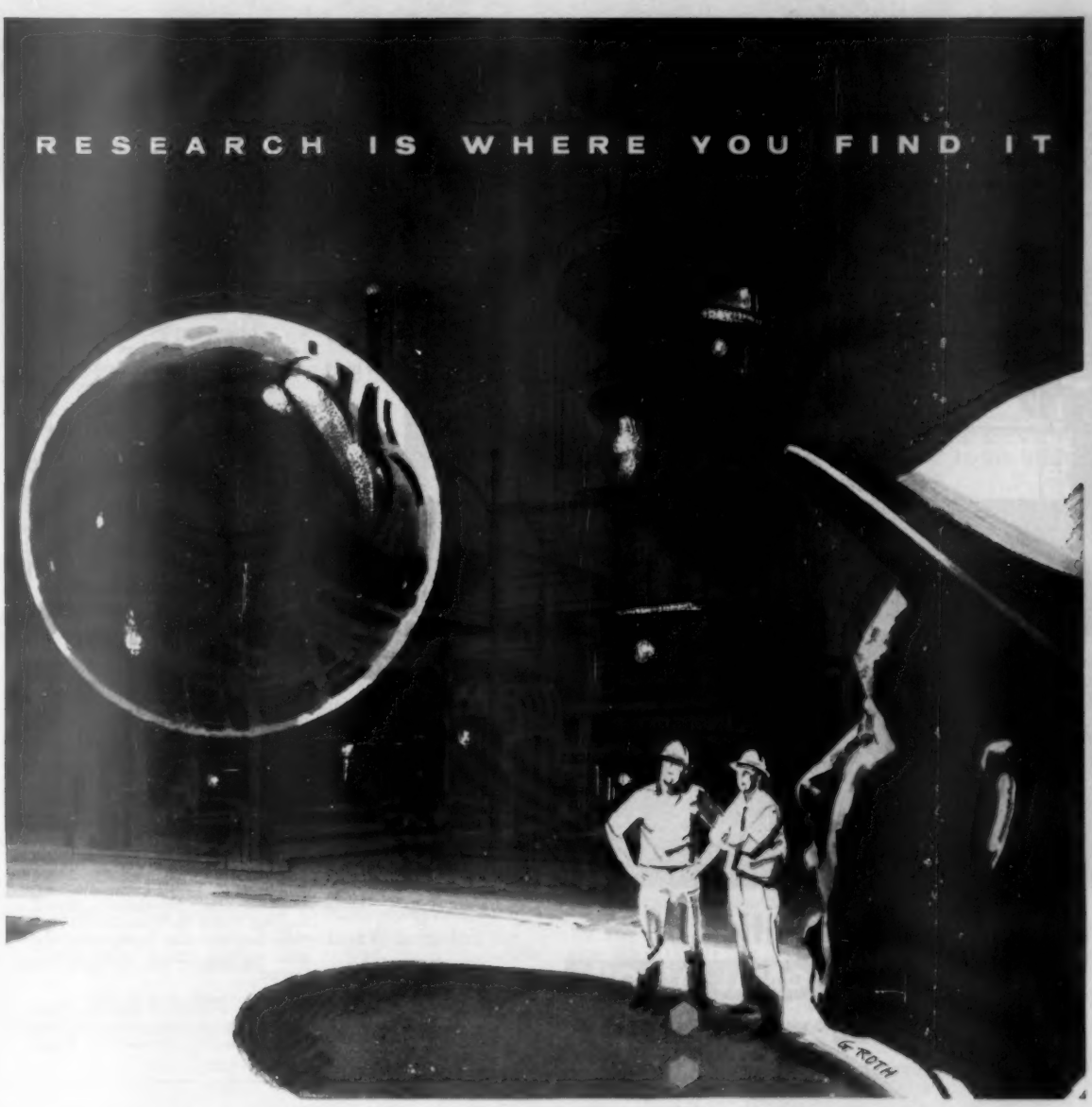
3-5 Interstate Oil Compact Commission, annual meeting, Sheraton Hotel, Philadelphia.

6-9 American Institute of Chemical Engineers, annual meeting, Sheraton Palace Hotel, San Francisco.

11-15 Society of Automotive Engineers meeting, Sheraton-Cadillac and Statler Hotels, Detroit.

JANUARY

22 Natural Gasoline Association of America, Gulf Coast regional meet-



The 5-foot bubble . . .

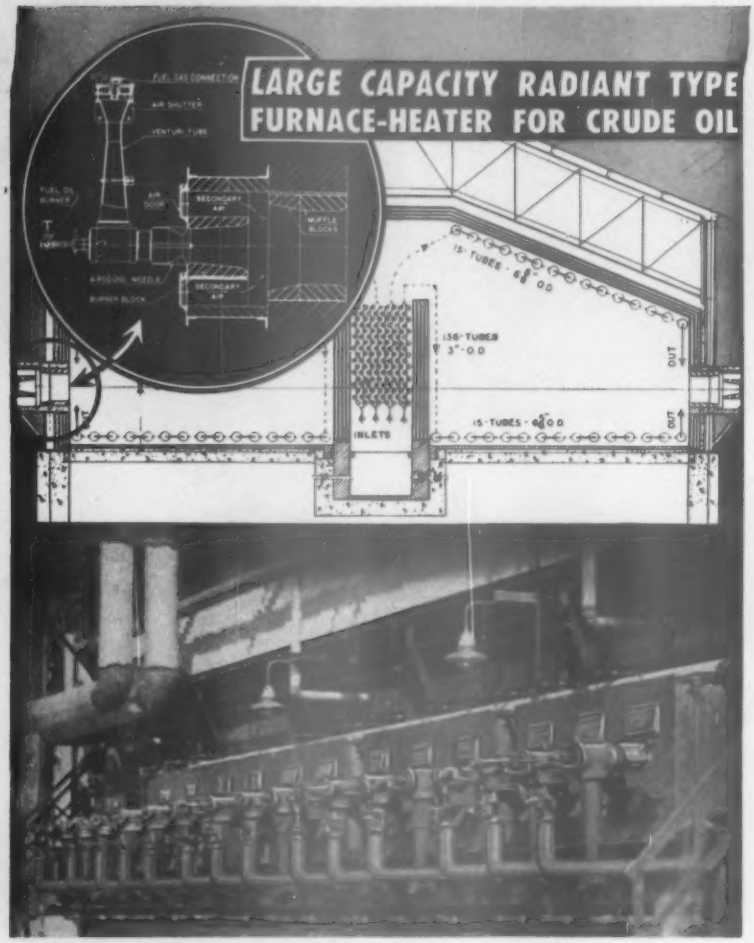
Weird things can happen when pilot plant data are scaled up to a full-sized petroleum processing unit. Well-nigh unmeasurable and apparently harmless effects in the pilot plant can attain major proportions in full-scale production.

A harmless 2-inch vapor bubble in a pilot plant, for example, may correspond to a 5-foot bubble in the commercial unit. Such things must be prevented!

Applying over four decades of "scaling up know-how," Universal engineers design plants that achieve the same results with tens of thousands of barrels of feed stock as those developed in pilot plant studies involving less than a barrel.

Research is where you find it. Utilizing its results for the benefit of petroleum refiners is a major part of the business of UOP.

UOP® **UNIVERSAL OIL PRODUCTS COMPANY** 30 ALGONQUIN ROAD
DES PLAINES, ILLINOIS, U. S. A.
More Than Forty Years Of Leadership In Petroleum Refining Technology



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Tandem Combustion Units

This Alcorn double side fired Petroleum Heater is especially designed to accent the importance of maximum heat absorption by radiation with a high degree of separation of radiant and convection heats.

National Airoil Combination Gas and Oil Tandem Units play a significant role in accomplishing this result by uniformly distributing the heat without flame impingement to the tube surfaces at the same time insuring complete and efficient combustion throughout a wide capacity range.

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ing, Robert Driscoll Hotel, Corpus Christi, Tex.

25-28 *Plant Maintenance and Engineering* Show, produced by Clapp & Poliak, Inc., Convention Hall, Philadelphia.

31-Feb. 3 Pipe Line Contractors Association, annual meeting, Ambassador Hotel, Los Angeles.

FEBRUARY

1-5 Instrument Society of America, instrument-automation conference and exhibit, Houston Coliseum, Houston.

8 Alberta Division of Canadian Petroleum Association, annual meeting, Hotel Palliser, Calgary.

8-10 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Billings, Mont.

14-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Statler-Hilton and McAlpin hotels, New York.

21-24 American Institute of Chemical Engineers, meeting, Biltmore Hotel, Atlanta.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

MARCH

2-4 American Petroleum Institute, Division of Production, southwestern district meeting, Statler-Hilton Hotel, Dallas.

7 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.

14-18 National Association of Corrosion Engineers, sixteenth annual meeting, Memorial Auditorium, Dallas.

16-18 American Petroleum Institute, Division of Production, southern district meeting, Hilton Hotel, San Antonio.

18 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

21-23 Midwest Gas Association, annual meeting, Hotel St. Paul, St. Paul.

24-25 New England Gas Association, annual meeting, Hotel Statler-Hilton, Boston.

30-Apr. 1 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita.

APRIL

3-8 Engineers Joint Council, sixth nuclear congress, New York.

4-7 Oil Heat Institute of America, annual convention, Park-Sheraton Hotel, New York.

4-7 National oil heat and air-conditioning exposition, Coliseum, New York.

5-7 Instrument Society of America, national chemical and petroleum instrumentation symposium, Rochester, N. Y.

19-21 University of Oklahoma, College of Engineering, southwestern gas measurement short course, north campus, University of Oklahoma, Norman.

20-22 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

20-22 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

24-26 Independent Petroleum Association of America, midyear meeting, Denver Hilton Hotel, Denver.

HOW TO MAKE EXTRA PROFIT WHEN USING BARITE RECOVERY MACHINES

You will be money ahead if you answer these important questions before using any barite recovery machine

How Is Barite Lost?

Most Barite is lost when the tanks are jetted to remove excess solids in the form of fine drilled clays. *If this jetting were not necessary, there would be little need for a barite recovery machine.* When you jet your tanks to get rid of unwanted clays, you also jet out large quantities of valuable barite. The problem is to *selectively* discard unwanted clays and retain costly barites, while processing a minimum volume of mud.

So What Should A Machine Do?

The first and most important requirement is *to reject drilled clays.* Next in importance is the barite recovery efficiency. Virtually no chemicals used in drilling muds can be separated from drilled clays with practical equipment. For that reason, the higher the clay rejection efficiency, the less mud need be processed. As a result, *chemical and barite losses are held to a minimum.*

High clay rejection efficiency is an important reason why the *Clayjector®* is preferred by so many operators. As a matter of fact, it was named Clayjector to dramatize the importance of clay rejection.

What Are Some Other Requirements?

During mud maintenance, the high clay rejection and barite recovery efficiencies shown in the table below are of great importance. Together they result in less barite lost for each pound of clay removed.

Where reserve pits contain important quantities of barite, the Clayjector is outstanding. It has a much higher capacity than other type machines and it delivers *almost completely pure barite. This is an important advantage when very heavy muds are used,* since the clay content of these muds must be closely controlled.

Because of unusually low rental costs, the Clayjector has been proved profitable when as few as 60 sacks of barite per day are required for mud maintenance.

The Clayjector is simple and easy to operate. It is easy to move and it is flexible in operation. All barite is returned as a smooth slurry that is easy to mix. The unit results in faster drilling and greater safety from lost circulation or blowouts because closer control of mud is possible.

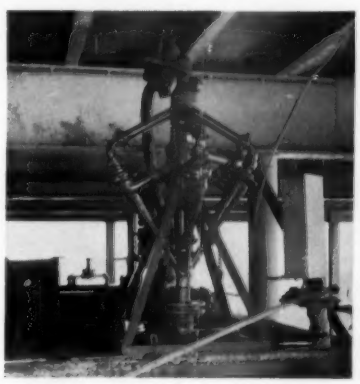
Get the whole story from your SWACO representative or write us direct. If you have been using other barite recovery machines, you will be surprised at the added savings you can make. If you are not using a barite machine, and are using weighted mud of over 11.5 pounds per gallon, you probably can save money by installing a Clayjector.

®Clayjector is trademark of Dorr Oliver, Inc., Stamford, Conn.

FIELD PERFORMANCE DATA ON CLAYJECTORS

	Stream	Weight #/gal	Flow gpm	Bar. Rec. %	% Clay Rejec.
Offshore, La. 15.1 #/gal mud 1 Clone S.G. Bar = 4.18 10/22/58	u.f. o.f.	17.3 8.9	3.3 21.4	95.1	71.1
Offshore, La. 14.8 #/gal mud 2 Clones S.G. Bar = 4.17 11/1/58	u.f. o.f.	17.1 8.9	6.8 40.0	89.7	73.0
Offshore, La. 13.6 #/gal mud 1 Clone S.G. Bar = 4.19 about 11/25/57	u.f. o.f.	16.0 8.8	3.8 21.4	93.8	73.7

U.F. = Underflow — Barite slurry returned to mud system.
O.F. = Overflow — Light solids and fluids to waste.
These results were calculated by an independent testing laboratory from samples taken at the rig.



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SALT WATER CONTROL Inc.

1809 Continental National Bank Bldg. Phone: ED 2-4434 Ft. Worth 2, Texas

HUDSON Combin-aire

LOW TEMPERATURE COOLING USING COMBINATION OF MINIMUM WATER AND MAXIMUM AIR

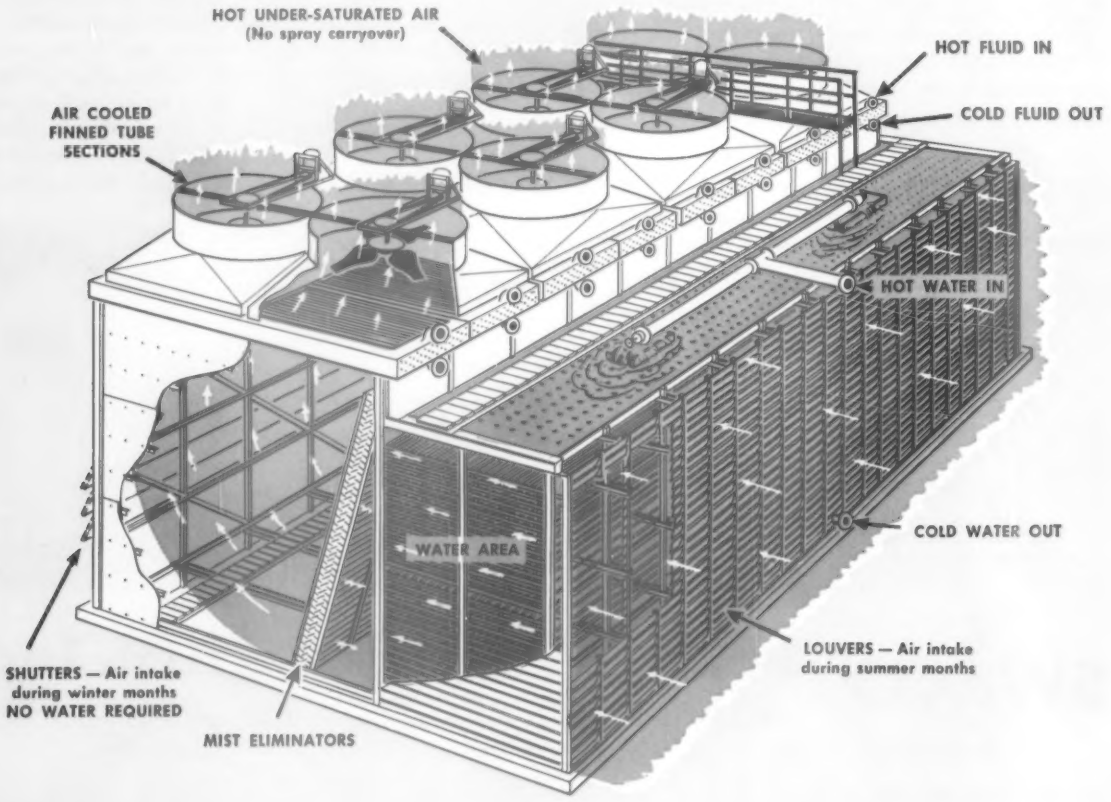
In recent years Hudson Solo-aire cooling in which only air is used as a cooling medium has been installed by the world's largest refineries. In recent cases of three separate 40,000 barrel complete refineries in locations where unlimited water is accessible Hudson Solo-aires are used for *all* process cooling.

So that air could be used for cooling those process streams requiring lower terminal temperatures than obtainable with ambient summer air temperatures, Hudson developed and in 1949 installed the first Combin-aire cooling unit. Since that time Combin-aires have proven their worth in installations for over 80 services in major refineries, chemical plants and gas processing plants in the United States, the Middle East, Europe, Mexico and South America.

In Combin-aire cooling, high temperature ambient air is first pre-cooled by direct contact with water, the cooled air then becoming the low temperature cooling medium for fin-tube elements. Cooling of air, and subsequent use of the cooled air for fin-tube cooling of process streams, are effected in one integrated structure — the Combin-aire.

Cooling with Combin-aire to overcome the occasional limitation of high ambient temperatures has the following advantages:

- **Absolute minimum water consumption consistent with attainment of low terminal process stream temperatures.**
- **Water circulation may be made automatically responsive to air temperatures with no water circulated except at high ambient temperature.**
- **No water treatment necessary. Salt water or brackish water may be used.**
- **No spray carryover or condensation. After passing across the fin-tube elements the heated air leaving the Combin-aire at elevated temperature is undersaturated with water vapor and cannot precipitate condensate or carry water spray.**
- **Minimum piping. Combin-aire may be installed immediately adjacent to other process equipment.**
- **Clean air to fin-tube units. During the hot season air is washed, removing dust, sand and insects.**

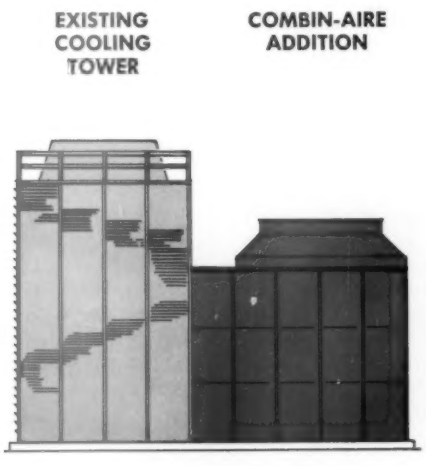


When Combin-aires are installed as adjuncts to cooling systems using existing shell and tube or other water cooled equipment the cooled water from the bottom of the Combin-aire may be used in such equipment. The Combin-aire then takes on the additional function of a water cooling tower with, however, the advantages over conventional cooling towers of dual use of both air and water and elimination of water spray carryover and condensate precipitation.

In over 80 services and under a wide range of atmospheric operating conditions Combin-aire units have amply fulfilled performance and mechanical specifications. Before proceeding with a new process unit or revamping or adding to present cooling systems let Hudson give objective assistance in determining the most economic balance in the use of air cooling, Combin-aire cooling and water cooling.

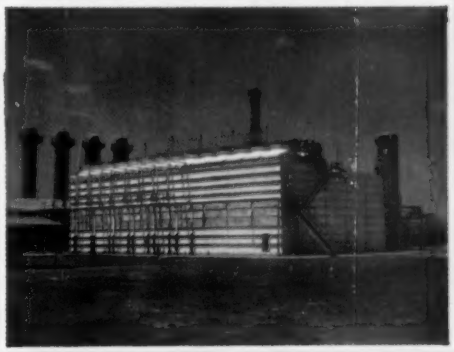
CONVERTING COOLING TOWERS INTO COMBIN-AIRE UNITS

Presently installed cooling towers may be used as the basis for Combin-aire cooling by installing structure with fin-tube elements and fans immediately adjacent to the cooling tower with air for the fin-tube elements being drawn across the water near the bottom of the cooling tower, thus increasing the capacity of the cooling tower, and cooling the air for use in the fin-tube elements.



Combin-aire is protected by U. S. Patents, Patents pending and copyrights.

TEXAS —
COSDEN PETROLEUM CORPORATION
Big Spring, Texas



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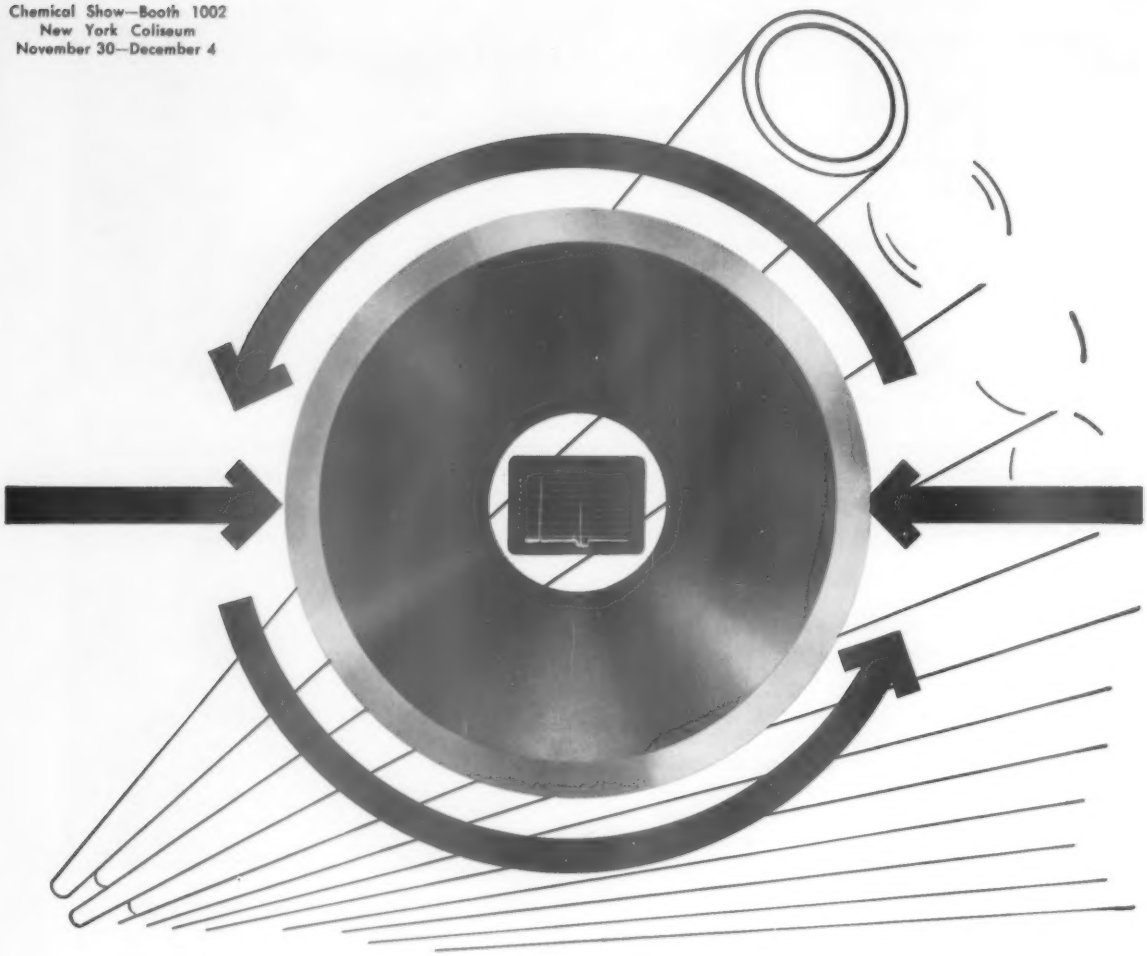

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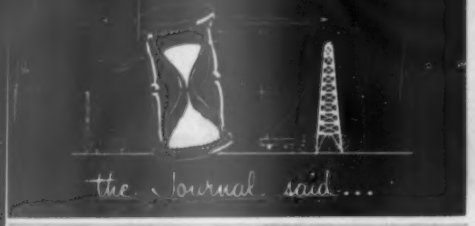


50 years ago

October 20, 1909

Paw Paw Gas Co. organizes with capital of $3,000,000 to lay a gas line from the Caney gas area, north of Bartlesville, in northern Oklahoma and southern Kansas, to the booming new lead and zinc mining district north of Miami, Okla.

Associated Oil Co. contracts with Twenty-five Oil Co. for the delivery of 4,000,000 bbl. of oil from the prolific Midway field, in Kern County, California, for 50 cents a barrel, 10 cents above previous moving prices. Deal virtually assures Associated will lay oil line into Midway, giving the district its third pipeline outlet.

Drilling of six dry holes in a row, and three severe storms lead Producers Oil Co. (Texaco) to pull out of Markham field, in northern Matagorda County, Texas Gulf Coast. Leases turned back.

25 years ago

October 25, 1934

Newly set up Federal Tender Board goes into action in East Texas clearing way to control interstate shipments of crude oil and its products. Damper placed on illegally produced oil.

Spreading gasoline price wars and threats of crude oil price cuts start agitation within petroleum industry for formation of oil exchange. New York Commodity Exchange appoints committee to study the proposals.

First Oriskany (Lower Devonian) sand production in West Virginia opened by discovery in Elk District, Kanawha County. Discovery well, Grosscup and others 1 Burdette, flows 80 bbl. of oil per day while deepening in new pay below 2,100 ft.

10 years ago

October 27, 1949

World's largest fluid catalytic cracking unit goes into operation at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J. Daily charge capacity is 41,000 bbl.

Natural gas starts through Michigan-Wisconsin Pipe Line Co.'s newly completed 1,609-mile pipeline from the Texas panhandle to Detroit. Line to supply 56,000 M.M.c.f. of gas annually to Michigan-Wisconsin industrial area.

New remote discovery by Imperial Oil Ltd., 30 miles south of Peace River jumps Alberta (Canada) oil play more than 200 miles northwest from nearest other production, Redwater field, northeast of Edmonton. Imperial's discovery well, 1 Normandville, flows 189 bbl. daily from 6,730-ft. Devonian formation.

JOURNALLY SPEAKING

Not So Crazy

OIL MEN have short memories.

Producers are snorting and snickering at a suggestion made by U. S. Representative Tom Steed of Oklahoma. Steed observed that since control of imports hasn't increased Oklahoma's market for crude, and since there is a political hassle every month over what the allowables should be, perhaps the federal Government ought to set allowables for all states.

Crazy, say most oil men.. Nobody wants federal control. The idea is preposterous, unthinkable, not worth serious consideration. It couldn't happen.

But they forget what happened back in the 1930's. The oil industry came within an ace of federal regulation of production, not once but several times. The idea was seriously espoused by a good many people in the oil industry and by its sincere friends in high places.

It could happen again if the imbalance between supply and demand continues. And there is an ominous parallel between conditions then and now. The differences are mainly in degree.

During and immediately after World War I there was a world-wide oil shortage, while demand increased rapidly. But new oil fields were discovered and developed quickly, new refineries, pipelines, and tankers were constructed, and growth in demand tapered off. By the late 1920's there was a world-wide surplus. Imports zoomed, domestic overproduction increased, and prices hit the skids.

Oil producers and oil-producing states realized that their revenues would disappear without some sort of conservation system that would stop the oversupply and hold some oil in the ground until there was a need for it. The question was how.

Producers in some fields tried voluntary proration, and some crude buyers tried pipeline proration, but these were ineffective. A few oil men, notably Henry L. Doherty, president of Cities Service, advocated federal control. Others countered with the idea of state proration, but there was general doubt that enough states would cooperate to make this effective.

President Coolidge created the Federal Oil Conservation Board which considered federal control but said state regulation should be tried first. A plan for an interstate oil compact was drafted, putting strict obligations on all producing states and establishing a "czar" to enforce them. Congress probably would have adopted this plan had not the newly formed IPAA insisted that reducing imports would solve the problem.

So Congress put a tax on oil imports, and everybody relaxed. But oversupply got worse. Agitation for regulation revived. Interior Secretary Harold Ickes sponsored a bill for federal regulation of crude production and refinery runs, and congressional committees considered it at length. A good many oil men supported it—reluctantly, but as the only alternative to continued oversupply, waste of oil, and ruinous prices.

Finally, about 1935, several of the larger oil states adopted effective conservation and proration measures and formed the present Interstate Oil Compact Commission. Many people criticized this compact for lack of teeth, and doubted that enough states would prorate sufficiently to do the job, but Congress approved it and shelved the federal-control bill.

Also, about that time, demand began to pick up all over the world, the surplus was reduced, and federal control was forgotten.

Now look at the present. Again a postwar boom in demand has tapered off, leaving world-wide overcapacity. Producers' prices and oil-state revenues are suffering. Controls were put on imports, but the oversupply continues. There is a big argument over how to divide up the available market, and each state accuses the others of overproducing.

So, in that light, what's so crazy about Representative Steed's proposal? His logic is that imports were controlled to reduce the oversupply and make the domestic industry healthy, but since that didn't do the whole job Congress should take the next step and curb the oversupply at home.

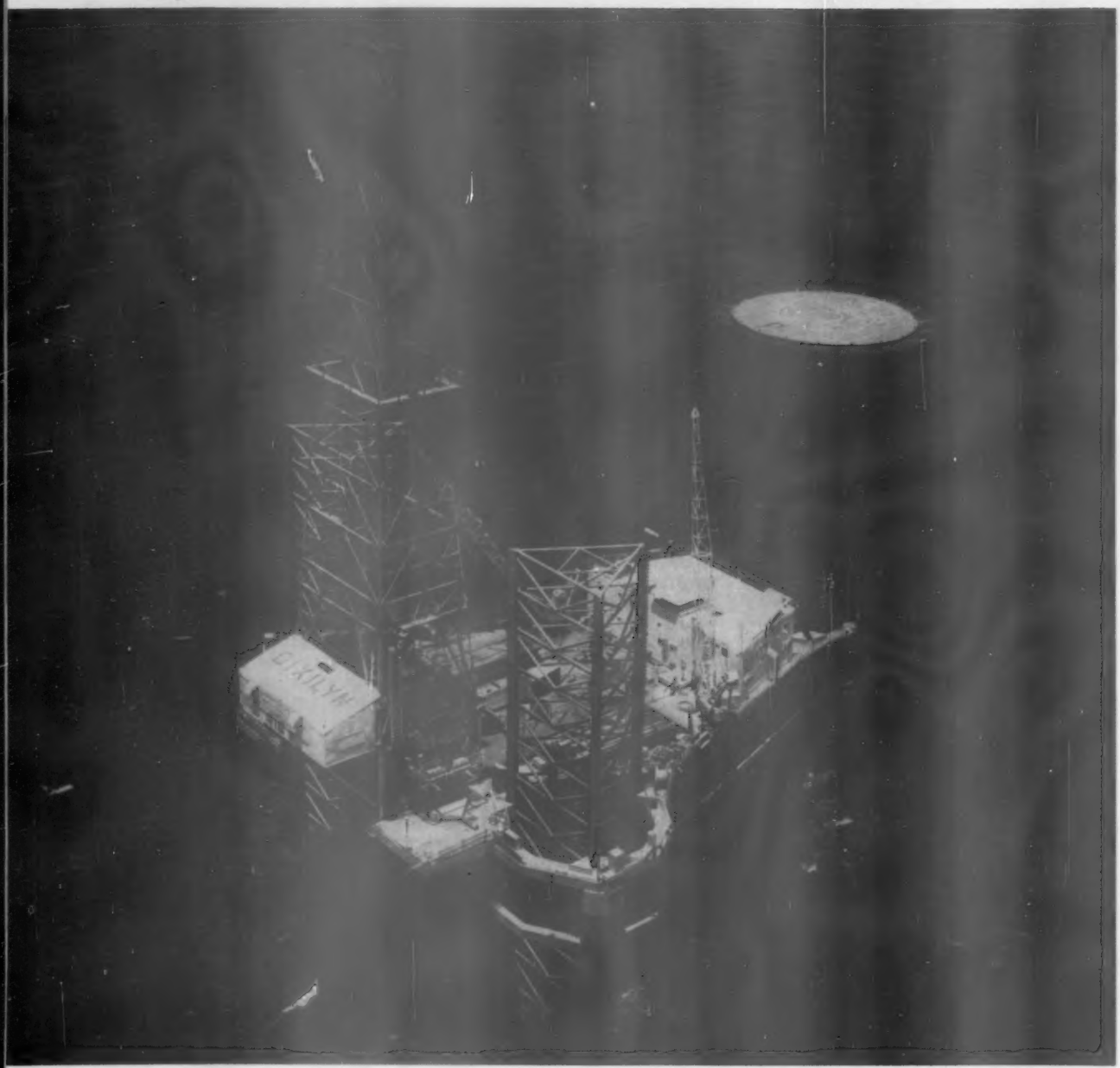
Once before it was only the imminent threat of federal control that forced some producing states into proration. History could repeat.

—Henry D. Ralph.

Draw works showing Tiger Brand Wire Rope after 14 months of service. Only the best wire rope was good enough for this job.

50 miles offshore

Dixilyn Drilling uses USS Tiger Brand—



50 miles offshore the "Julie Ann" is drilling in the Vermillion area southwest of New Orleans. The million-pound derrick is rigged with Tiger Brand Wire Rope to assure long, trouble-free service.

and west of the Pecos—

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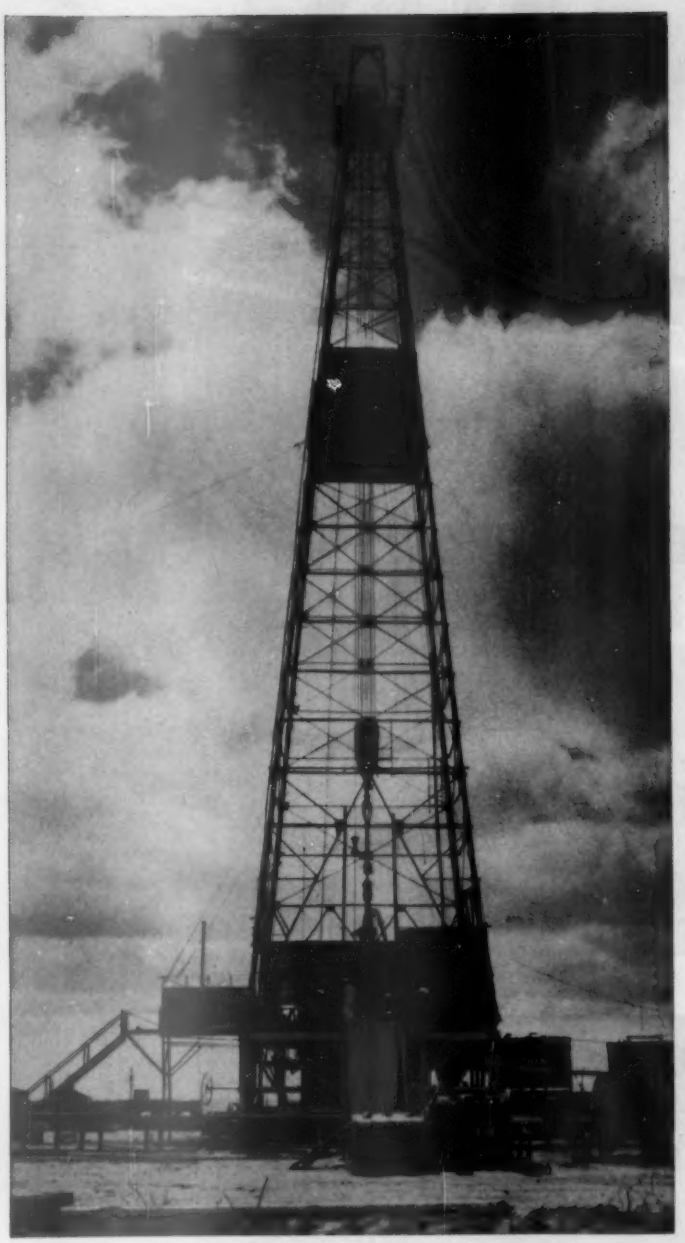

West of the Pecos River, Dixilyn Rig No. 3 drilling near Odessa, Texas, Upton County. The 7,500 feet of Tiger Brand 1¼" Drilling line being used on this well had already drilled three wells without trouble. The tool pusher, Mr. J. B. Booth, is very satisfied with the service he gets from USS Tiger Brand drilling lines.

The "Julie Ann" is the newest offshore drilling platform of Dixilyn Drilling Corporation, New Orleans. It can drill in water over 100 feet deep—to drilling depths in excess of 25,000 feet. It is the first LeTourneau drilling platform designed to include 175-foot legs. The million-pound, two-well derrick is mounted to permit the drilling of six wells from the same platform location.

Dixilyn operates a total of seven rigs—all are equipped with USS Tiger Brand Wire Rope. Mr. Russel V. Tidwell, General Manager, says, "We use Tiger Brand because it gives us better service than any other rope we ever tried. We watch our ton-mile records and Tiger Brand has definitely reduced our wire rope costs."

The "Julie Ann" is rigged with 5,000 feet of 1½-inch Tiger Brand Monitor Excellay Preformed Rotary Drilling Line. The rope had been in service 14 months when the photographs were taken and it was still in excellent condition.

For complete information about Tiger Brand Wire Rope for oilfield use, write for our catalog, American Steel & Wire, Dept. 9328, 614 Superior Ave., N.W., Cleveland 13, Ohio.

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How to survive in the oil business

THE HEAD of the world's biggest oil company has revealed his formula for keeping it the world's biggest. It's pretty good advice for everybody else in every branch of the oil business.

The first thing you have to do, says Monroe Jackson Rathbone, president of Jersey Standard, is to recognize that conditions aren't what they used to be and they aren't going to change back for quite a spell. For several more years the whole industry has got to live with excess capacity and intense competition.

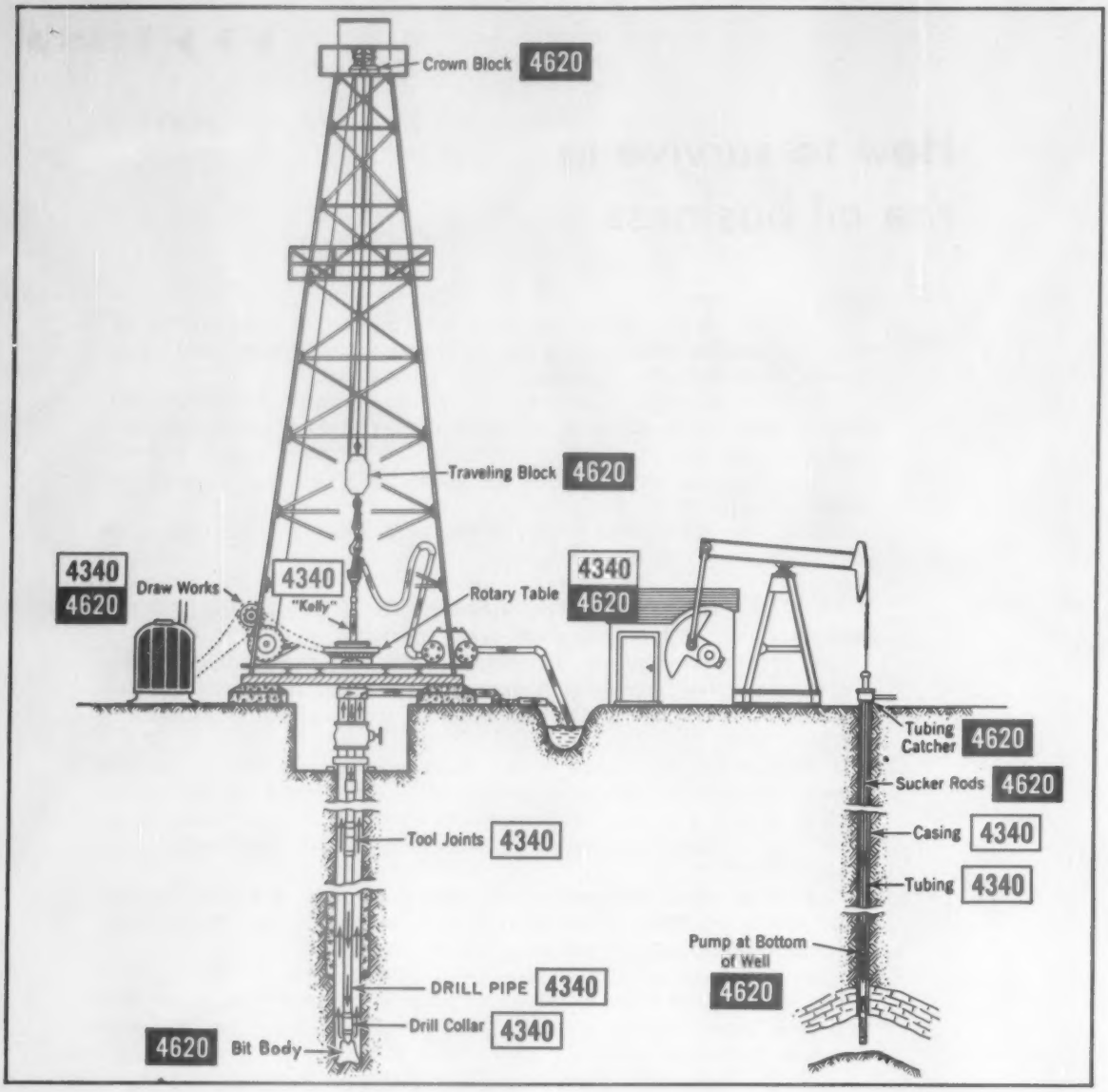
Then you have to be ready, willing, and able—all three—to adapt your operations to these conditions.

HERE ARE THE ELEMENTS of Jersey's formula, plus some comments on how they might apply elsewhere:

- Get more output per man-hour, at all levels. This includes automation, mechanization, streamlining, decentralization, and elimination of deadwood, inefficiency, and featherbedding from the executive suite down to the plant level.
- Conserve your capital by not investing in projects that just increase capacity. Use your money for things that will increase profits on your present volume. So why drill more wells in places where buyers won't take all the crude that's available now? And why drill two wells on a tract that one well could drain?
- Make more intensive use of existing facilities. "Facilities" include wells, people, machines, refineries, filling stations, and dollars. There's room for improved efficiency in the use of all of them.
- Get along on a lower margin of reserve capacity. Why carry 6 weeks' stocks of oil when there's plenty more where that came from? Why drill up a known reserve when the present wells there can produce more than can be sold now?
- Buy from others when you can buy it cheaper than you can make it. This applies to services as well as commodities. And if refiners would buy up distress lots of low-priced products more frequently—and cut their own runs proportionately—they would not only save cash currently but would also strengthen the whole products market.
- Maintain research. This includes all sorts of open-minded inquiry as well as lab work. Business will improve eventually, and you want to be ready for any opportunities.

THIS PRESCRIPTION is sound and widely applicable, though in the producing end it needs assistance from state legislatures and conservation authorities.

It's also painful. But as Jack Rathbone says, our trouble is growing pains, and it's a lot better to suffer growing pains than hardening of the arteries.



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RUSSELL B. BROWN will clear off his desk for the last time soon when he steps down as general counsel and chief Washington spokesman for the IPAA.

How to Get Along in Washington

• Russell Brown, IPAA general counsel, offers this formula for improving the atmosphere for oil in the nation's capital: Stay informed and learn to judge Washington developments; keep industry spokesmen supplied with information and always be ready to fight distortions which put oil in a bad light.

Clyde La Motte
Washington Editor

OIL MEN appreciate one fact about Washington more every day: The task of keeping the industry informed on developments there and of keeping Washington informed about the industry is tremendous.

What's more it is growing more important all the time.

Government is getting more and more involved in virtually every facet of oil industry operations. The prospect is this can only increase. It certainly won't decrease.

An important man who operates in this zone between government and industry is the Washington representative of a company or association.

Prime example is Russell Brown, who has been around Washington for 30 years as a spokesman for the Independent Petroleum Association of America.

There are many who have disagreed with Brown on one or more occasions. But it is not likely that many disagree with his views on the basic elements of what is needed—and will continue to be needed—to provide a successful oil operation in Washington.

These key factors are:

... **Develop within** the industry a knowledge and understanding of Washington events and their impact.

... **Keep Washington** officials supplied with information and explanation so that the industry may be better understood.

... **Stay everlastingly** at the task of correcting misinformation and distortions which put the industry in a bad light.

An informed industry . . . Many industry officials, wrapped up in their own work, often appear unaware of trends and developments in Washington—even though their own operations may be directly affected.

When they do become aware of what is happening, it often is too late to do anything about it. They also may not be able to evaluate the situation properly.

One of Brown's principal roles, as he has envisioned it, has been to comment frequently—and often at length—on Washington issues which relate directly or indirectly to oil.

This is not simply reporting, but explaining, evaluating, and interpreting.

Brown does this largely by letters sent regularly to IPAA members, and through his visits with them at conventions and on other occasions.

Obviously, the letters can be used for other purposes. For one thing, they provide an avenue for letting congressmen and others, including the press, know the producers' views.

And they can be used to warn

Brown has been fighting the imports battle since 1930.

THE IPAA will be saying its formal farewell to Russell B. Brown at a dinner during the association's meeting in Dallas. For, at the end of this year, Brown will retire as general counsel of the association.

It obviously is going to take the IPAA—and the industry—some time to adjust to the fact that Brown will no longer be the "voice" of the producers in Washington.

It takes time to break a long habit, and for 30 years now many producers have had the habit of turning to Brown for help and advice in situations involving the industry and the federal Government.

Brown's years of service with the IPAA have had a great many highlights. For him personally, the greatest moments have been those in which he saw all the industry join its forces to lick a big problem facing it and the nation.

He remembers the bleak depression days when there was panic in the land and a very grave possibility that this nation's oil industry would be socialized at the stroke of a government pen. Instead, the industry worked together under the temporary expedient of the National Recovery Act. (Brown was assistant to the chairman and compliance director of the Petroleum Code Authority.)

He remembers, too, the dark days of World War II when there was a desperate shortage of oil for this nation's war machine. And again he saw the industry respond magnificently, with trains of tank cars roaring across the nation on passenger car schedules, and with "inch" pipelines built in an unbelievably short time against staggering odds to provide East Coast refineries with crude.

Russell B. Brown
. . . career spans some stormy days.

Brown is convinced that only a vigorous, daring industry, with all its component parts geared together, could serve its nation so well.

On the other hand, Brown has seen the oil industry badly divided in Washington, making mistakes that cost it dearly and which sometimes helped make it a political whipping boy.

True, Brown himself has fought for the benefit of a segment of the industry—the producers. But he did so with the inner conviction that what he was supporting was for the long-range good of the industry as a whole. For, as he puts it, unless the industry is strong, no segment within it can long prosper.

Take, for instance, the case of imports. Brown originally went to Washington in 1930 when crude oil from Mexico in particular was creating a problem.

He was a leader in the successful effort, in 1932, to get a 21 cent a barrel "tax" placed on imported oil, and he feels that this had a great deal to do with saving the industry from financial ruin at that time.

IPAA has continued to fight against what it deems as "excessive" imports, and Brown has been in the center of that fight.

Brown's basic belief is that government controls should be avoided whenever possible, but he thinks there are times when no other solution seems possible. For instance, he feels that the passage of the Connally Hot Oil Act did much to stabilize production and thereby stabilize the industry. (Incidentally, he scribbled a first, tentative draft of the act on the back of an envelope.)

All in all, Brown has been a vigorous advocate of oil in Washington through all these years. There is no doubt that he loves the industry. And there is good reason to suspect that, generally, the vice versa is equally true—even with many of those who have disagreed with him.

opponents that the IPAA will put up a fight on this issue or that.

Primarily, however, the main purpose of the report letter is to provide a continuing link between Washington and the man in the oil patch.

An informed government . . . As Washington gets deeper and deeper involved in matters affecting oil, it must have more and more information about the industry.

A regulatory group, such as the Oil Import Administration or the Federal Power Commission, must develop a broad understanding of the industry and its operations if it is to do an adequate job. Most government officials in such agencies are keenly aware of this, and they welcome reliable information.

This need presents to the industry an opportunity and a challenge to supply information.

Similar opportunities arise when congressional committees hold hearings on subjects relating to oil. True, in some instances the committee members have their minds made up in advance. In other instances, it is obvious that an axe is being ground.

Even so, it might surprise the outsider to know how often a congressional committee is earnestly seeking reliable information and views to help guide it in drafting or changing legislation.

Brown's procedure in these situations vary. He may write an informal letter to a committee chairman, or he may appear before a committee. At times, he may get the IPAA president or some other spokesman to present the association's views.

If an issue is important enough to warrant it, Brown may suggest to his members that they get in touch with their congressman and let him know how they feel. And there have been occasions when he has encouraged the march of a delegation on Washington.

An informed public . . . One tough and never-ending job a Washington representative faces is trying to correct incorrect, incomplete, or misleading statements by Washington officials and stories appearing in the press.

There are times when errors or distortions apparently are made intentionally by someone seeking to make a political whipping boy out

of the industry or some segment of it.

In other cases, a misstatement or misinterpretation may stem from a lack of facts or proper understanding.

In any event, Brown usually goes barging in. He figures that if it's an intentional misrepresentation, a public statement of the IPAA version may take the sting out of the charges.

If it is an unintentional mistake, Brown feels that presenting the facts as IPAA sees them will help prevent reoccurrences.

So Brown writes a lot of letters to congressmen, to editors, column writers, and others. He thinks it has paid off in gradually gaining a more favorable attitude from some who previously had fired darts at the industry.

Brown's critics feel that he uses this technique too often. There are times, they say, when it is best to sit quietly and let a fire burn out rather than to fan the blaze to greater heights by heaping counter charges on the embers.

Perhaps it all proves that there can be no hard and fast rules to guide a Washington operation.

Responsibilities of a "voice" . . . There is little doubt that one of the dangers the representative of any segment of the industry faces in Washington is that of losing a broad perspective of the industry as a whole.

This is understandable, even if undesirable. A representative obviously is sent to Washington to support a given group and a given set of views.

Brown, for instance, was sent to Washington nearly 30 years ago to help seek government action to protect domestic producers against a rising tide of imports from abroad. He has been harping on that theme ever since—as all but the stone deaf must know.

Some people (led principally by the importers, naturally) think that Brown has overdone this theme—to the detriment of the industry as a whole and perhaps to the detriment of the consuming public, too.

Brown vigorously denies this, pointing out that cabinet committees, congressional committees, and others who have made thorough studies of the problem have found that protection of the domestic industry is essential to the welfare of the nation.

An evaluation of Brown probably cannot be made with full clarity for several years. Then perhaps time will reveal the impact his 30 years' work has made in Washington.

But few would deny that Brown leaves a definite imprint when he winds up his work with IPAA at the end of this year.

High Stocks Are Mystery

. . . so Texas Railroad Commission plans some sleuthing of products-stocks figures at its next meeting in November.

AN EXASPERATED Texas Railroad Commission next month will attempt to put its finger on products-stocks excesses which forced the agency to hold Texas crude allowables to a low 9-day pattern for the fifth consecutive month.

Continuation of the 9-day schedule for November will mean a daily crude allowable next month of 2,750,375 bbl. daily. This, due to the one fewer days in November, will mean a nominal hike of 35,513 bbl. daily over the initial allowable for October and of 67,803 bbl. daily over that in effect October 3.

Though the allowable was increased a bit, it was anticipated generally after the October allowable was set that the November increase would be much larger.

The commission grilled major crude purchasers extensively at the October 16 hearing on each firm's products-stocks position. Yet, though these stocks total more than 60,000,000 bbl. higher than indicated as desired by the industry for this time of year, no company would admit that its own stocks were on the high side.

None of the major firm representatives, however, were able to give figures in barrels as to their product stocks now held and the levels they recommended as desirable for November 1 at the hearing last March.

Purchasers were told that the commission wants these figures in hand when the next allowable hearing is held November 20.

The Texas body finds it particularly vexing that demand for Texas crude has not increased substantially when, by holding the state's allowable to a low level for a prolonged period, the commission has finally managed to cut once-burgeoning crude inventories well below figures suggested by the industry as desirable.

Needs vary . . . Nominations for Texas crude made by purchasers at the hearing ranged from a low of 8 days by Atlantic Refining Co. to a high of 11 days by Sun Oil Co.

Humble, Cities Service, Texaco, and Standard of Texas sought 10 days. Mobil, Gulf, Shell, Indiana Oil Purchasing, Sinclair, and Phillips asked for a continuation on the 9-day pattern.

Joe Owens of Sun said his firm had been buying some spot oil during October and would have to buy, in addition, about 7,000 bbl. daily during November for each day under an 11-day pattern.

Gulf's J. G. Coates said his company had drawn down its stocks by about 31,000 bbl. daily in October and would continue the pull at the rate of about 9,000 bbl. daily on 9 days in November. Gulf's stocks, he said, are now in good shape.

Humble will continue to buy the 30,000 bbl. daily of spot oil it has been buying all year and in addition would need to buy 30,000 bbl. daily more on 10 days—still more on 9 days, according to Charles Shaver.

Spokesmen for Sinclair, Phillips, Cities Service, and Standard of Texas testified that their stocks were either low or in good shape.

ALLOWABLES BY DISTRICTS

District—	November	Change over Oct. 3
1. Southwest	52,086	138
2. Gulf Coast	110,205	3,151
3. Gulf Coast	363,267	6,973
4. Southwest	182,518	4,659
5. East Central	29,013	713
6. Outside East Texas field	111,697	2,761
6. East Texas field	134,686	3,844
7-B. N. Central	152,108	5,903
7-C. W. Central	134,595	2,773
8. West Texas	1,086,388	30,489
9. North Texas	267,320	3,465
10. Panhandle	126,492	2,934
TOTAL	2,750,375	67,803

The culprits . . . E. O. Thompson, commission chairman, read into the record figures which show that the current product excesses are in gasoline, distillate, and residual fuel.

Distillate inventories, standing at 174.2 million barrels as of October 3, were 30.2 million barrels over the level indicated by the majors as desirable for that time of year.

Gasoline stocks were 17.2 million barrels too high. And residual stocks were 12.3 million barrels above the desired level. Kerosene was almost on the money at 32.2 million barrels. Crude stocks were 6.2 million barrels too low.

Competition Is Squeezing Venezuela

- Jersey Standard executive warns fellow Venezuelans their country stands to lose markets to Middle East and North African oil unless the country beats down the competition for these markets.

COMPETE efficiently or go under.

That, in essence, is the warning given the Venezuelan oil industry last week by one of its own. To make certain the warning was not misunderstood or misinterpreted—it was voiced in Spanish.

The occasion was a Caracas meeting of the American Institute of Mechanical Engineers. The speaker was Dr. Siro Vazquez, coordinator of producing activities for big Jersey Standard, and easily one of the Venezuelan oil industry's most distinguished graduates.

The Vazquez message was a plea as much as it was a warning. His appeal for increased efficiency to keep pace with the intense competition in the industry today is in direct contrast to new governmental philosophies toward oil in Caracas.

Dr. Juan Pablo Perez Alfonso, Venezuela's oil minister in the democratic administration of Romulo Betancourt, makes no secret of the fact that he doesn't want Venezuelan oil to compete in world markets.

The government line in Venezuela today, as expressed by Perez Alfonso, is a "holding" operation for the industry. Any expansion or competition for new markets is not only frowned upon, but actively discouraged.

Vazquez warned that Venezuela is quite likely to backslide unless it recognizes some of the present day facts of life in the world-wide oil industry. As an engineer who has devoted 30 years of his professional life to the Venezuelan industry, Vazquez is eminently qualified to voice such a warning.

He told the group of engineers that he was frankly appealing to them to use their "ability and devotion to make our industry more efficient and competitive."

The Venezuelan industry has already lost its geographic advantages in many of the world's oil markets because lower posted prices and reduced tanker rates make Middle East oils cheaper to the buyer.

The Jersey production coordinator told the group of technical men that theirs is the power to make Venezuela competitive in spite of the fact that the industry in the last 10 years has changed from "a producer's paradise in a seller's market, into an industry characterized by a most competitive buyer's market, under a serious oversupply condition."

JERSEY'S Siro Vazquez outlined to a Caracas audience how Canadian, European, and U.S. markets now supplied by Venezuelan crude could be lost to other crude sources.

Here's his list of ABC's:

. . . **Minimize** expenditures.

. . . **Minimize** the investment needed to do any given job and then make the money stretch more.

. . . **Use the best** techniques to find oil cheaply and improve on them.

. . . **Produce fields** so efficiently they will yield all the recoverable oil.

. . . **Drill cheaper** wells on wider spacing.

Vazquez described the oil industry as still strong and dynamic. He cited an increase of 800,000 bbl. daily in demand each year to back him up. Then he warned that "all producing areas" are "strongly competing for markets to obtain a share of this growing demand."

He pointed out that in the 1953-1958 period, Venezuela's oil output grew 48%, a faster rate than the world-wide industry as a whole.

"Within a privileged industry, the Venezuelan industry has been especially privileged," he commented.

Excess capacity . . . In pointing up the competitive problems facing the industry throughout the world, Vazquez cited the oversupply of oil today.

He said the free world's oil producing countries last year could have easily produced 5,280,000 bbl. daily more than demand.

"These figures, large as they are, do not tell the whole story about the magnitude of the supplies looking for a home," Vazquez said. "The figures represent only the actual, immediately available supplies.

"They fail to show the pressure of the large potential that can be made

How Venezuelan Oil Is Losing Market Advantages to Kuwait Oil

Tia Juana Medium (26° API) vs. Kuwait (32° API)

Unloading Ports	Freight Advantage* $ Per Barrel		Posted Price Advantage† $ Per Barrel		Quality Advantage $ per Barrel	Total Advantage, Venezuelan over Middle East $ Per Barrel	
	1950	1959	1950	1959		1950	1959
Montreal	.72	.58	—.55	—.63	—.17	.00	—.22
Los Angeles	.89	.72	—.55	—.63	—.17	.17	—.08
New York	.83	.67	—.55	—.63	—.17	.11	—.13
Rio de Janeiro	.59	.47	—.55	—.63	—.06	—.02	—.22
Buenos Aires	.46	.37	—.55	—.63	—.06	—.15	—.32
Southampton	.37	.29	—.55	—.63	.00	—.18	—.34
Genoa/Naples	.08	.07	—.55	—.63	.00	—.47	—.56

*Basic Freight Rate—1950: USMC—39%. 1959: USMC—51%.
†Crude Price—Tia Juana Med.—1950: $2.30/bbl. 1959: $2.30/bbl. Kuwait—1950: $1.75/bbl. 1959: $1.67/bbl.

Venezuela's Export Picture Is Changing

	1950 Thousand B/D	1950 % of Total Country Demand	1958 Thousand B/D	1958 % of Total Country Demand
United States	613	9	1,050	12
Canada	106	29	220	30
Central & South America	254	38	550	46
Europe	318	25	510	15
Africa and Other	70	7	120	6
Total	1,361	13	2,450	15

World's Excess Producing Capacity

Thousands of barrels daily

	1953	1958	Increase 1953-1958
U. S. and Canada	1,600	3,560	1,960
Venezuela	0	800	800
Central & South America	0	0	0
Europe and Africa	0	20	20
Middle and Far East	400	900	500
Free World	2,000	5,280	3,280

available by the drilling of a few wells with minimum investments in certain areas, particularly the Middle East and North Africa."

Venezuela's markets . . . Vazquez compared Venezuelan oil output and its markets in 1950 and last year and noted that in the 8-year span, Venezuelan supplies to Europe dropped from 25% of the total demand to only 15%.

Europe, he reminded, is the first priority market for "low-cost" Middle East crude, new North African supplies, and growing Russian exports.

"If Venezuela is successful in retaining a position in the European market, it will be under the most difficult competitive conditions."

He warned also that the traditional U. S. and Canadian markets may not always fall as naturally to Venezuela as they have in the past. He pointed to an excess productive capacity of 3 million barrels a day in the U. S., or more than 30% of current demand. This, he reminded, has resulted in import restrictions.

In Canada, where Venezuela has traditionally enjoyed one of its best export markets, pressure is increasing for a pipeline to Montreal to move western Canadian crude into this market.

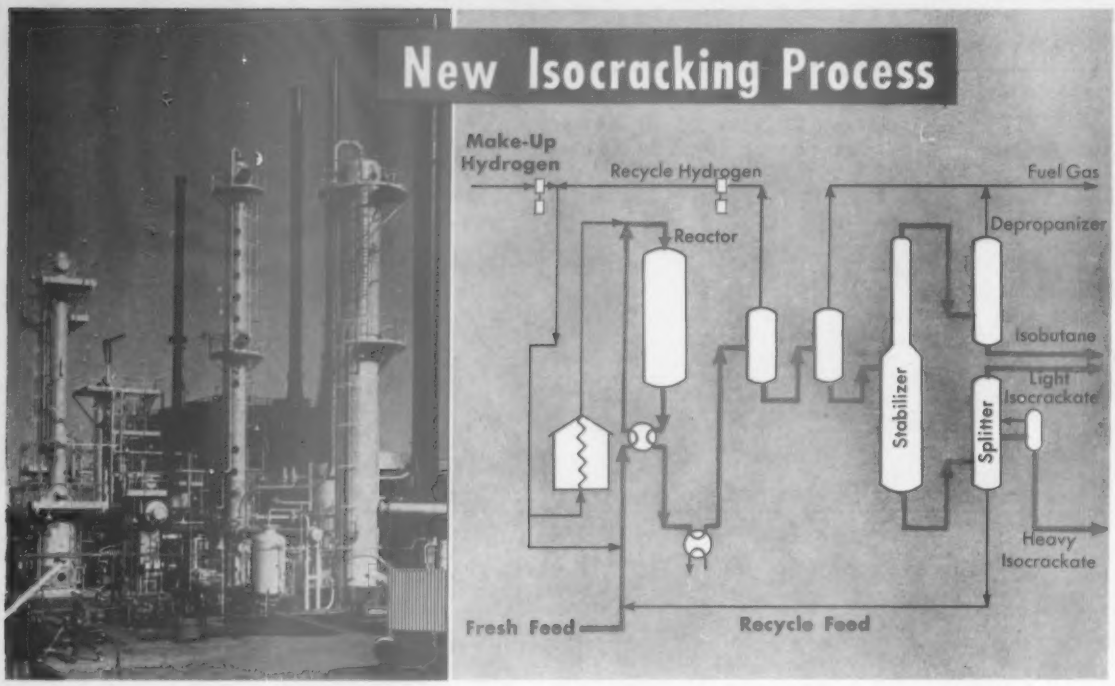
A Look at World-wide Supply and Demand

Millions of barrels daily

	DEMAND 1953	DEMAND 1958	DEMAND % Increase	CRUDE PRODUCTION 1953	CRUDE PRODUCTION 1958	CRUDE PRODUCTION % Increase
Western Hemisphere						
United States	7.6	9.1	19	6.4	6.7	4
Canada	0.5	0.7	47	0.2	0.5	104
Venezuela	0.1	0.2	64	1.8	2.6	48
Other Countries	0.9	1.3	42	0.5	0.7	44
Total Western Hemisphere	9.1	11.3	24	8.9	10.5	17
Eastern Hemisphere						
Europe	1.8	3.3	82	0.1	0.2	242
Africa	0.4	0.5	29	0.1	0.1	72
Middle East	0.3	0.5	75	2.4	4.3	76
Far East	0.7	1.2	65	0.3	0.5	42
Total Eastern Hemisphere	3.2	5.5	72	2.9	5.1	76
Free World	12.3	16.8	36	11.8	15.6	32
USSR & Satellites	1.3	2.4	85	1.3	2.5	93
WORLD TOTAL	13.6	19.2	41	13.1	18.1	37

A more pressing problem now is competition from the Middle East in Canadian markets.

The answer, Vazquez insisted, lies at least in part in the hands of the Venezuelan industry's technical people. Controlling costs to remain competitive is the challenge posed by today's world oil situation to the technical man.



New Process Has Big Possibilities

• Isocracking will give refiners a chance to get a better product and to meet gasoline octane competition. Cal Research terms process one of the most significant refining advances in 10 years and plans to make it available to others under a licensing setup.

David H. Stormont
West Coast Editor

REFINERS now have a new tool for upgrading hard-to-crack distillates into high-octane gasoline components—a low temperature hydrocracking process called "Isocracking."

Working on such charge stocks as coker distillate and refractory cycle oil, the new process results in better than 100% yields of very high-octane gasoline components. Virtually no fuel gas is produced.

California Research Corp., research subsidiary of Standard Oil Co. of California, developed the versatile new catalytic process. Before it was unveiled last week, the process had been thoroughly tested in a commercial plant built in the past year at Standard of California's Richmond, Calif., refinery.

Terming it "one of the most significant advances in a decade of refinery science," Cal Research's president, A. L. Lyman, said the process will be made available to other refiners through licensing arrangements.

In the search for a rugged long-life catalyst, more than 1,000 were prepared and tested. Over 2,000 catalyst screening tests were performed. Construction of the full-scale plant was preceded by more than 100,000 hours of pilot-plant studies.

Process flow . . . The process is carried out in conventional equipment.

Major equipment includes a reactor, feed-reaction mix exchanger, hydrogen furnace, and appropriate distillation facilities to recover products and recycle feed. Where necessary, Hydrofining is included in the feed-preparation section.

Temperatures used in the reactor vary from 400° to 700° F., well below those used in other distillate-upgrading processes. Pressures may range from 500 to 2,000 psig. Conversion rate is 50 to 70% per pass, with total recycle of material boiling higher than the desired gasoline end point.

Cal Research unveiled little on the nature of the catalyst used, other than saying it costs much less than conventional noble metal reforming or isomerization catalysts.

Feed stocks and yields . . . Typical feed stocks are heavy naphthas, light cycle oils, and coker distillates.

The whole liquid product can be used for gasoline blending. But generally it is preferable to split it into a light Isocracked fraction (C_5 to about 180° F.) and a heavier fraction. The 114-116% (liquid volume) yields of butane-plus material are typical, according to Cal Research.

Significance . . . Introduction of the process comes at a time when refiners are faced with the need for reducing the sensitivity of their gasolines. At the same time they must maintain octane ratings (OGJ, Oct. 12, p. 98).

Olefins are the poorest performers on sensitivity under high-speed conditions. Aromatics are better and paraffinic components are the most valuable.

Isocracking will help the refiner in replacing olefins with saturated hydrocarbons. The light product contains higher than equilibrium concentrations of light isoparaffins. Naphthenes predominate in the heavier C_7-C_8 fractions, which thus make attractive cat reformer feed stocks.

Unusual results . . . Isocracking gives some unusual results since they are governed by reaction mechanism rather than thermodynamic equilibrium limitations. Among these are:

. . . Light product fractions contain isoparaffins which are far on the iso side of thermodynamic equilibrium.

. . . Heavy aromatics are cracked without substantial saturation or loss of ring structure.

. . . Aromatics are demethylated without producing methane. One of the most striking reactions involves polymethyl benzenes. These demethylate rapidly, but instead of forming methane, the methyl groups turn up as liquid isoparaffins.

. . . Heavy naphthenes are cracked without appreciable loss of ring structure and characteristically yield naphthenes in the C_7-C_8 boiling range.

. . . Naphtha fractions produced can be catalytically reformed to the 104-108 octane level in high yields and at moderate severity.

Some strange bed-fellows are found as a result of the reaction mechanism. Butane and pentane fractions contain isoparaffins in proportions to be expected from an isomerization process operating at near room temperature. On the other hand, it was pointed out, the methyl cyclopentane-cyclohexane fraction contains the former isomer in the high proportions expected from high temperature isomerization. This unusual combination contributes strongly to the high octane rating of Isocracker gasoline.

Cost data . . . Economics for the process are favorable, since conventional equipment and moderate process conditions are used.

A Cal Research spokesman said on-plot cost of a unit ranges from $350 to $450 per daily barrel of reactor charge, and operating costs are comparable to those for a two-stage catalytic reformer.

Economic studies carried out by Cal Research show that a unit will often pay out, before tax, in 2 years. This assumes that adequate reformer hydrogen is available. Where installation of a hydrogen manufacturing plant is required, about 6 months is added to the project payout period. In plants where the process is installed for fuel-oil reduction purposes, before-tax payouts of 1.2 to 1.7 years are indicated with the feed priced at its cutter stock value.

A Look at Isocracking Yields . . .

	From Heavy Cracked Naphtha		From Catalytic Cycle Oil	
Typical Feed Stocks				
Gravity, °API	36.7		31.0	
ASTM Distillation				
5%	372		415	
10%	376		430	
50%	383		478	
90%	405		523	
End Point	450		570	
Composition, Vol. %				
Paraffins	25		5	
Naphthenes	32		46	
Aromatics	43		49	
	100		100	
Octane Rating				
F-1 at 3 ml. TEL	80.7		. . .	
Typical Products				
Yields	Wt. %	Vol. %	Wt. %	Vol. %
C_1 (Methane)	0.01	. . . .	0.01	. . . .
C_2 (Ethane)	0.6	. . . .	0.1	. . . .
C_3's	3.6	. . . .	1.7	. . . .
Isobutane	9.4	14.0	4.5	7.0
n-Butane	4.0	5.8	2.8	4.2
C_5+ Isocrackate	84.8	94.0	93.4	105.4
C_4+ Isocrackate	98.2	113.8	100.7	116.6
Gasoline Stocks	C_5-180° F.	180-360° F.	C_5-180° F.	180-400° F
Yield, Vol. % C_5+	28	72	23	77
Inspections				
Gravity, °API	81.7	46.1	82.0	44.3
Octane Rating				
F-1 at 3 ml. TEL	100	94.6	100	93.8
F-2 at 3 ml. TEL	100.6	. . . .	100.6	. . . .
F-1 at 3 ml. TEL*	. . . .	104.8	. . . .	104.5
Composition, Vol. %				
Paraffins	81	22	84	23
Naphthenes	16	38	13	36
Aromatics	3	40	3	41
	100	100	100	100

*After platinum reforming to 91V% C_5+.

Where used . . . Hydrocracking with the Isocracking process will be economically attractive in a wide range of refinery situations.

Cal Research's economic studies point to the following applications:

. . . For fuel-oil reduction and crude-throughput reductions in refineries where light gas oils are available in excess of fuel-oil viscosity blending or sales requirements. This is particularly true of refineries where substantial coking is carried out.

. . . For octane improvement. Payouts are particularly attractive when octane improvement must be obtained in an expanding gasoline market. For increasing gasoline octane level, the process is more attractive than any other in many situations.

. . . For gasoline-volatility control. The process will be especially valuable when volatility specifications prevent inclusion of otherwise available heavy high-octane stocks.

. . . For maximum gasoline production. The refiner can improve his overall economics by converting more of his crude into profitable light products.

Standard of California is considering the building of other Isocrackers, but where the first will be built has not been announced. First uses probably will be for octane improvement and fuel-oil reduction.

Sentiment Grows for Prorating Floods

• Roswell hearings reveal rising trend toward some sort of restriction on production at secondary-recovery projects. If New Mexico decides to prorate floods, it has two specific routes to follow.

THE IMPORTANT question whether to prorate water-flood production is under study by the New Mexico Oil Conservation Commission.

Actually the commission has to make two decisions on:

... **General feasibility of restricting** water-flood rates in New Mexico.

... **Specific plans of proration** offered during a 2-day hearing in Roswell.

Plans were offered at the hearings by Dan Nutter, commission chief engineer, and Humble Oil & Refining Co., which has been a stout advocate of restricting water floods for several years.

Nutter advocated an arbitrary maximum allowable of 42 bbl. daily per water-flood well in southeast New Mexico, 52 bbl. daily in northwest New Mexico—both based on 40-acre spacing.

The 42-bbl. figure for southeast New Mexico would be about 7 bbl. daily higher than the present basic unit allowable for a well under 5,000 ft.

The Humble proposal would restrict water-flood production to the basic unit allowable.

Nutter's plan, industry analysts say, apparently would not apply to pressure-maintenance floods, thus these would be subject to the basic unit allowable and would produce less oil than a so-called secondary flood.

The Humble plan would not differentiate between the two types of projects.

Interest high . . . Industry interest in the flood proration problem was amply evidenced at the hearings by capacity crowds representing more than 50 major firms and independent operators.

Prorating floods has been a hot issue for several years. And the problem has steadily grown with the rising importance of secondary oil in the total U.S. production picture.

In all areas where the issue has arisen, however, opponents of water-flood proration have successfully defended unlimited flood production with arguments that a flood, once started, cannot be restricted without loss of otherwise recoverable reserves.

Humble has vigorously contested such arguments in the past. It claimed that floods can be restricted without loss of reserves and that wide-open flood output is so shrinking the market available to primary wells that exploration is actually being discouraged.

Since a flood obviously cannot be carried out twice in the same reservoir, the issue is difficult to resolve one way or the other.

Tide turning? . . . There was evidence at Roswell, however, that sentiment is growing in the industry favoring some sort of restriction on flood production.

Humble's position and its suggested new rules were ably presented by Roy A. Baze, company division engineer at Midland, Tex.; Claude R. Hocott, research director at Houston; and W. G. Greenwalt, chief reservoir engineer at Houston.

The position of Cities Service Oil Co. also was presented in a statement to the commission by E. E. Funk. Cities Service produces much of its oil by secondary methods.

Funk said, "From our experience, operating a number of water-flood projects, we conclude that oil production rates can be controlled on many water-flood projects on a long-term basis if the operator is informed of the control in advance and if the operator is given permission to develop his project in stages so that stimulated wells produce at capacity while the project as a whole does not exceed a pre-set oil production rate.

"The project production rate, to be fair and workable, should be the standard state spacing unit allowable times the number of developed spacing units in the project without regard to each well's actual use or performance.

"This same level of oil production

watching WASHINGTON

Clyde La Motte

• U. S.-Canada gas problem: Who's boss?

A PROBLEM relating to long range Canada-to-U. S. gas supplies is beginning to take shape on the horizon.

This is the problem: What will happen one of these years if a U. S. regulatory body and its counterpart in Canada should disagree over the price or supply of a system already in service?

For instance, the Canadian-government or the government of one of the oil provinces might at some time set a minimum price on gas from a given field. That, in turn, might hike the cost of gas at the border to more than the price the FPC had approved for the purchasing U. S. pipeline.

Since the U. S. agency wouldn't have authority over the Canadian agency, and vice versa, obviously there would be danger of a deadlock.

Or suppose a Canadian agency should grant its producers authority to abandon service to a line supplying gas to the U. S. What could the FPC do about it?

The problem would become even greater if politics got mixed up in it. You can imagine the campaign issue that could be made in eastern Canada should the con-

on a project basis is also fair and workable and should be applied to all other injection processes . . . and for all commonly injected fluids . . .

"The operator needs considerable leeway on development rate to permit him to initiate timely cooperative injection agreements with adjacent operators and to permit the use of peripheral or line drive injection well arrangements if such arrangements are deemed better than a pattern arrangement for the particular project."

Other interested companies were not all on the other side of the fence.

Several indicated they felt they could live, if certain changes were made, under the Nutter plan or that submitted by Humble. They included: Sinclair Oil & Gas Co., Sunray Mid-Continent Oil Co., Sun Oil Co., Union Oil Co., Pan American Petroleum Corp., Shell Oil Co., Atlantic Refining Co., and Texaco Inc.

Several of these felt some exceptive provision should be made to provide added allowable under special circumstances, such as pilot projects. Some felt revisions necessary in the rules suggested by Nutter for increasing allowable for added wells on closer than 40-acre spacing.

But they appeared receptive, at least, to the basic idea of restricting flood production.

Others oppose . . . Opposition to restricting floods was still strong at Roswell.

Among these favoring maximum flood production were: Phillips Petroleum Co., Mobil Oil Co., Gulf Oil Corp., Standard Oil Co. of Texas, and a large group of independent operators.

Skelly Oil Co., Tidewater Oil Co., and British-American Oil Producing Co. did not oppose but reserved the right, as provided by the commission, to make statements within 15 days from close of the hearing.

John Buckwalter of Ryder-Scott Co., Wichita Falls, Tex., argued that in water flooding "any manner of curtailment of producing wells will result in a decrease in the ultimate recovery of oil. Unless you produce at capacity, waste will result."

Buckwalter said the question was academic in New Mexico anyway because total water-flood production over basic allowables was only 4,500 bbl. daily. And total water-flood oil in the state represents only 3.7% of the state's total production.

These figures were lower than those presented by Nutter. The commission engineer said water-flood production over basic allowables in the state now was running at 7,000 bbl. daily. This had resulted, he said, in a 2-bbl. per day cut in the allowable of a primary well in southeast New Mexico.

Big Barge Gets Job

. . . on offshore Louisiana well for Tennessee Gas.

"MR. LOUIE," the giant new barge of Universal Drilling Co., is finally going to work for the first time.

Commissioned last February and idle since then, the $5-million barge has been leased by Reading & Bates Offshore Drilling Co., Tulsa, and will spud a well off Louisiana for Tennessee Gas Transmission Co.

Reading & Bates took a 6-year lease on the barge with an option to buy and has lined up considerable work for it in the Louisiana offshore area. Details of the agreement were not released.

Louis J. Roussel, New Orleans, is president of Universal Drilling, which was organized by Roussel for the purpose of building the barge. He had not, however, been able to find a drilling job for the 4,000-ton, 133-ft.-wide barge (OGJ, Feb. 23, p. 89).

Reading & Bates will put it to work in Block 215, Eugene Island area, on a lease Tennessee Gas acquired by farmout from Phillips Petroleum Co. The first well, to be spudded late this week, will be located in 110 ft. of water about 55 miles offshore, south of Horeshoe Bayou.

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sumers raise the cry that they were paying more for Canadian gas than U. S. users of Canadian gas.

A squawk could come from Canadian producers, too, if the price they were being paid for their gas was lower than the price for gas in the U. S. being used to supply the same U. S. pipeline.

The trouble is, no inter-governmental commission or procedure has been established to meet such problems. As a result, one nation could play a tune that the other would have to dance to, with no recourse.

Regulatory officials on each side of the border are aware of the potential problem. Thus far, they have approached it entirely on a cooperative basis and have discussed such possibilities as letting "observers" from one regulatory agency sit in on sessions of the other.

Some feel, however, that eventually it is going to be necessary to grant authority to an inter-government group or to use treaties to insure long-range gas-supply contracts. Therefore, tentative plans along that line may be broached in the not too distant future.

• Coal industry gears for more action . . .

DON'T OVERLOOK the significance of the reorganization of the National Coal Association, for the purpose behind it is to help make coal an even more vigorous competitor—and to give it more weight in Washington.

The association announced last week that Stephen F. Dunn, vice president of the National Association of Manufacturers, had resigned to become president of NCA. At NAM, Dunn was in charge of government relations, which indicates what his role will be with the coal group.

Furthermore, the coal association is broadening its scope to take in several other coal-industry organizations. Again, the chief aim is to give it a stronger Washington voice.

It will work hand-in-glove with other coal groups, such as the Coal Exporters Association, Inc., and the Fuels Research Council.

The move is indicative that the coal industry is going to make an all-out effort in Washington.

• Heat stays on regulatory agencies . . .

THE RECENT splash of criticism of government regulatory agencies is continuing to create ripples through the Government.

The blast by Louis J. Hector, who resigned from the CAB (OGJ, Oct. 5, p. 110), has been followed by comment from several administration officials who indicate they feel this is a problem worth some attention.

Only last week, Bradley Nash, deputy under secretary of commerce for transportation, said in a speech that Hector's public comments had given considerable drama to a new concept of the relationship between the executive branch of the Government and regulatory agencies.

"The heart of the new concept is that the executive branch should take full responsibility for the development of programs, determination of routes and rates, and the degree of competition to be permitted a carrier," Nash said.

"The regulatory agency as we know it today would become, in effect, an appellate court from administrative decisions."

West Tioga May Get 320-Acre Spacing

• Hunt Oil tells North Dakota commission field is example of how marginal area still can be developed commercially.

THE MUCH-talked-about trend to wider well spacing was indeed apparent in North Dakota last week.

At an October 20 hearing before the North Dakota Industrial Commission, Hunt Oil Co. sought an order providing 320-acre oil spacing for the Madison reservoir in the West Tioga field area.

The reservoir in question is a thin interval of a tight Madison section between 8,100 and 8,200 ft. Though the formation is relatively thick, effective porosity exists only in a zone ranging from 5 to 20 ft. thick, Hunt told the commission.

The prospective producing area, Hunt said, takes in about 17,000 acres in the West Tioga area of Williams County, about 3 miles west of Tioga field on the Nesson anticline.

This area, covering about 27 sections, includes parts of MacGregor Madison and West Tioga Madison fields. Both have 80-acre spacing rules, but neither has been developed.

Hunt Oil based its request for 320-acre spacing on evidence which it contends shows that the Madison in this area is such a poor pay that it cannot be developed on any narrower spacing. The wide spacing asked, it said, would permit recovery of about 8,000,000 bbl. of oil that otherwise would remain underground.

W. H. Bowie, chief engineer for the company, estimated primary recovery in the reservoir at about 500 bbl. per acre.

Exhibits showed there are now six producing wells in the field area, two of them recent re-entries. Hunt concludes from study of logs of these wells and of seven abandoned holes that the producing interval is continuous under the 17,000-acre area.

Rapid development planned . . . Bowie said wells drilled on the 320-acre-spacing pattern would adequately drain the reservoir.

Development on narrower spacing, he said, would be uneconomical and would not pay drilling costs.

Proof of this, Bowie said, lies in the fact that two wells already drilled in the reservoir on 80 and 160-acre spacing had been abandoned as uneconomical.

If the wide spacing pattern is adopted, Hunt will put three rigs to work immediately to develop and define the reservoir definitely and to evaluate secondary-recovery possibilities.

The West Tioga area, Bowie said, is a first-class example of how wide spacing and the avoidance of unnecessary wells can make possible the development and production of a marginal oil field that otherwise would not be commercial.

Hunt Oil's request was backed by Amerada Petroleum Corp. and Pure Oil Co.

There was some royalty-owner opposition, also. But no testimony was offered to contradict Hunt's technical presentation.

One oil company, formerly active in the area, testified it had abandoned operations in the area as uneconomic under any spacing pattern.

Under North Dakota law, the state commission adopts a temporary spacing pattern in a new field. The temporary pattern remains in effect 18 months after the discovery. Then further hearings are held to adopt a permanent pattern.

Oil laws reviewed . . . Hunt's wide-spacing application was preceded October 1 by a general hearing in Bismarck at which many oil operators testified before a special legislative research committee charged with reviewing the state's oil and gas laws.

Oil men at the hearing testified that North Dakota oil and gas laws are already among the most advanced in the country and have been highly effective in fostering development and encouraging exploration even in the face of adverse market conditions.

Voyages Prove Gas by Tanker Is Profitable

A NEW milestone in the history of the oil and gas business has been passed by a small test ship carrying liquefied methane from the U. S. Gulf Coast to Great Britain.

The Methane Pioneer has proven that overseas shipments of liquefied methane can be technically and commercially successful.

This means that vast gas reserves in such places as Venezuela, North Africa, and the Middle East potentially can be exported to European, or even U.S. markets.

New fleet . . . The next step in the project will be to build the first commercial-size vessel.

British Methane, Ltd., which has been carrying out the experimental project, will decide soon whether to build one 20,000-ton tanker, or two 10,000-ton tankers. The ship, or ships, will be built in British shipyards.

British Methane is owned jointly by the British Gas Council, and by Constock International Methane, Ltd., (Bahamas), in which Continental Oil Co. has half interest. So far, the partners have spent $6.7 million on the project.

The decision that the program would be commercial came after the Methane Pioneer completed five of seven scheduled trips. The natural-gas deliveries have shown that gas made from liquefied methane is several pence per therm less than the cost of coal gas made at Becton gas works, the largest in the world.

Time lag . . . First commercial shipment of liquefied methane, however, may be more than 2½ years away.

It will take nearly that long to build a plant to liquefy natural gas. Since a decision yet has not been made on a site for the plant, operations actually probably won't start until late 1962.

Decision on plant location also will determine the ship-building program. Two countries are reportedly being considered as a source of natural gas —Venezuela and Algeria. Libya also is an outside possibility.

If a Mediterranean source of gas is selected, only one ship will be built. But if the choice is Venezuela, two tankers will be needed.

The first ships will be of about 17,000 deadweight tons, slightly larger than a T-2 tanker. They will have a cargo capacity of 10,000 tons of liquid methane.

Decision to use specially built cargo ships virtually kills plans to build a trans-Mediterranean pipeline. Cost figures as high as $800 million were talked for the pipeline system to move gas from known fields in Algeria to continental European markets.

New Process* GUARANTEES

Lowest Product Recovery Cost
Shortest Unit Payout Time

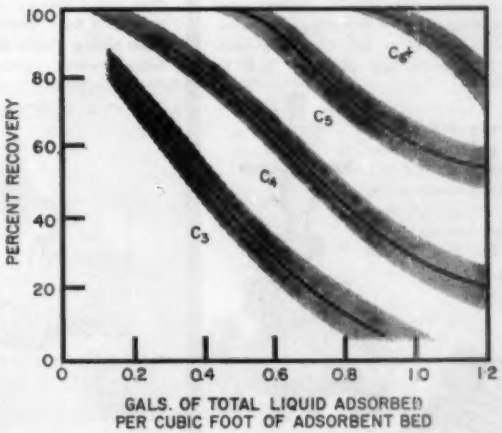
The Adsorption Process

DELTA DRYEX GASOLINE PLANT

The most economical commercial gasoline, butane and propane recovery process ever designed.

* Delta quotes a turnkey onstream installation with guaranteed recoveries.

- **A new concept for natural gasoline, butane and propane recovery.**
- **Recovers *both* natural gasoline and NGAA specification butane and propane.**
- **You get more product at a much lower cost (half in many cases) than any other commercial process.**
- **You are assured of shortest unit payout time.**
- **Dryex adsorption gasoline plants are complete including fractionation and refrigeration equipment which yield NGAA specification products.**



Dryex gasoline plants open a new realm of profit possibilities. Even those gas streams considered for other processes in the past and eliminated as economically impractical should be reviewed for a Dryex gasoline plant application.

LET DELTA ANALYZE YOUR GAS STREAM TO DETERMINE THE VALUE OF DRYEX TO YOU

Patent No. 2,880,818 dated April 7, 1959

DELTA

DELTA TANK MANUFACTURING CO., INC.

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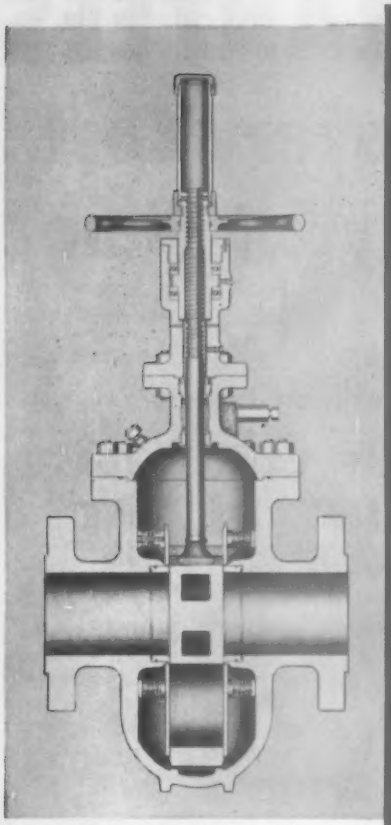
New Crane pipeline valves— high dependability . . . low upkeep



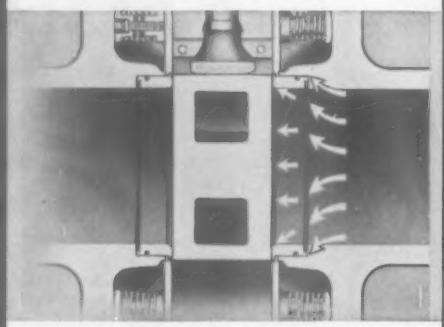
Everything you want in pipeline valves is built into these new Crane designs. They use line pressure to assure tightest sealing . . . work smoothly with all types of automatic operators . . . open and close easily . . . and permit easy servicing in the field.

You can install and all but forget these valves—they're so reliable . . . need little maintenance. You will like them on all gas and oil services—transmission and gathering lines, storage areas, pumping stations, tank farms and elsewhere.

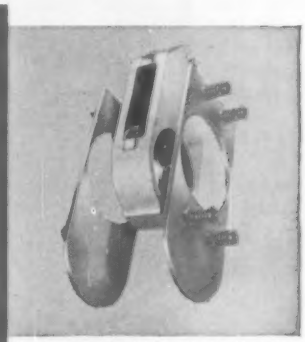
Check your pipeline valve needs with your Crane Representative. Ask for new 16-page bulletin. Or write to address below.

1. Stem protector excludes dirt, weather.
2. Ball bearings make operation easy.
3. Enclosed, grease-packed yoke.
4. Stuffing box packing injector—permits repacking under full line pressure.
5. Choice of three seats.
6. Conduit design permits easy passage of scraper.

New conduit-type gate valve. Full-way and venturi types; flanged and butt-welding ends. Sizes: Class 400—full-way, 4" to 30"; Class 600—full-way, 2" to 30"; venturi, both classes, 8" x 6" to 30" x 24".

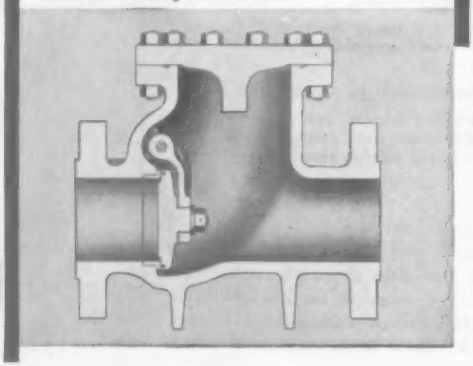


One-piece disc . . . self-sealing seats. Permit 2-directional flow. Line pressure aids in effecting tight outlet sealing. Choice of three seats: Metal-to-metal . . . Teflon-to-metal . . . grease-sealed.



Spring-loaded disc plates. Keep line dirt and foreign matter out of body chamber; retain lube grease in body well.

New double-disc gate valve. For gas line and other services. Classes 400 and 600. Flanged and butt-welding ends. Sizes 4" to 24". Guided, free-to-rotate discs minimize wear, prolong valve life, reduce maintenance.



◀ Crane Class 600 Swing-Check Valve

Here is the companion valve to use with Crane conduit-type or double-disc gates, which it matches in quality and dependable performance. Sizes: 4" to 24"; flanged and butt-welding ends.

1. **Clearway** disc swings entirely clear of fluid-way.
2. **Clearway** interior body design allows unrestricted disc function. Shallow cavity permits free passage of scraper.
3. Ports and seat opening are full diameter of pipe for smooth flow-through.
4. Stainless steel disc hinge swivels in Teflon sleeve bushing. Synthetic rubber disc insert provides "soft," tight seating.

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Alaskan Gas Line to Serve Anchorage Area

- Pipeline planned linking state's biggest city and Kenai gas find.

A GROUP of Houston and Los Angeles businessmen and engineers have put together an Alaskan pipeline deal in fast time to tap the new state's first gas discovery and serve the Anchorage market.

Anchorage Gas Corp., headed by Robert B. Baldwin of Houston, was ready when opportunity knocked. The company quickly opened the door—and now it's in business.

The proposal of a pipeline from the Kenai peninsula to Alaska's largest city came after the Baldwin interest went to Alaska in search of leases and mineral rights.

This led to an investigation of Anchorage's fuel situation. Baldwin found that no one had a franchise. So he went to work on the city council to get one.

This was long before Union Oil Co. of California and Ohio Oil Co. spudded their well on Kenai, about 30 miles south of Richfield Oil Corp.'s oil discovery of 1957.

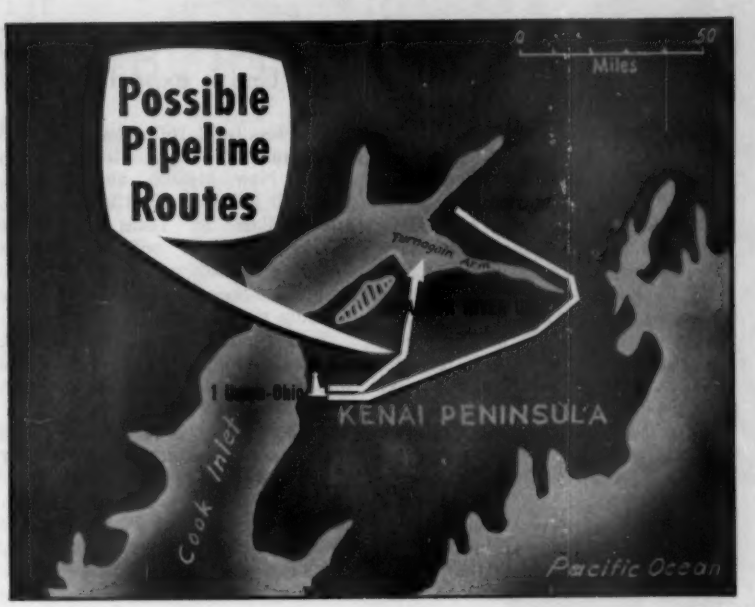
Anchorage Gas at first planned to service the city with manufactured gas or a propane-butane mixture shipped in from the West Coast. But the company kept a close tab on drilling developments in the Alaskan area, particularly on nearby Kenai.

When the Union-Ohio discovery became known, Anchorage Gas already had the city council's franchise and the citizens were voting 2-to-1 to ratify the council's action.

In short order, Baldwin wrapped up a deal for the newly discovered gas and received a guarantee from Union, the operator, that it would develop sufficient reserves to provide an estimated 30 million cubic feet of gas daily and 200 billion over a period of 20 years.

Although Union is still keeping its discovery a tight hole (OGJ, Oct. 6, p. 106), it has assured Anchorage Gas that the prospects are easily sufficient to make good on the contract. Already it is preparing to spud a second well and begin development of the needed reserves.

The market . . . Anchorage Gas currently has a survey team working in the Anchorage area to determine just how much gas will be needed now and in the future.



The survey will have a lot to do with the size of the line to be built.

The company will serve not only Anchorage but also two suburbs, Spenard and Fairview, which also voted in favor of the franchise. The three cities have a population of about 75,000, of which 35,000 is military. While there is not much industry yet in Anchorage, there are a number of smaller plants, and the military demand is considerable. Also, Anchorage's cold weather will increase the average use per customer.

At present, coal is the principal industrial fuel, and fuel oil is used for space heating. Some propane is used for cooking. The new natural-gas pipeline is expected to take over most of this market.

The prospects for future growth of the Anchorage area are considerable.

The pipeline . . . The big question facing Anchorage Gas is where to put the pipeline.

Delta Engineering Corp., whose president is a director of Anchorage Gas, is doing the engineering and will decide whether it is more feasible to take the long way around the peninsula and then back to Anchorage or whether to take a short cut across Turnagain Arm of Cook Inlet and directly to Anchorage.

The land route, which must cross both swampland and mountains on Kenai, will run about 165 miles, while a water crossing could be half that distance, depending on where the crossing was made.

Engineers currently are studying the hazards of the high tides in Cook Inlet and the scouring effect of heavy ice on the floor of the inlet.

The pipeline project is expected to cost some $12 million to $15 million, plus another $3 million or $4 million for distribution system in Anchorage.

The pipeline itself will be at least 12 in. in diameter and will be greater if the market survey justifies it.

Baldwin said last week he hopes to start construction by late April or early May next year—as soon as the thaw occurs. This would mean completion of the line in time for the 1960-61 winter season, a full year ahead of the required starting date under the franchise agreement.

However, if gas reserves have not been sufficiently developed by then, or construction problems loom larger than anticipated, the starting date will be delayed a year.

Who's in it . . . Anchorage Gas Corp. has 11 directors, six of whom are residents of Anchorage. Four are from Houston, and one is from Los Angeles.

The officers and directors are the sole owners, and the Houston group is in control. Those from Houston are Baldwin; George L. Gudenrath, president of Delta Engineering; and W. C. Smith, Jr., and Horace B. Webb, both associated with Baldwin.

The Los Angeles director is Frank Chilson, a consultant formerly with Fish Engineering Corp.

Pipe Laying to Begin on Transwestern

• Producers' promises of gas pave way for start this week on gas line from Texas to California. Line is expected to be in service next summer.

CONSTRUCTION will begin this week on the long-delayed $191-million gas system which Transwestern Pipeline Co. will operate from West Texas to the Arizona-California border.

The regulatory obstacles which have frustrated the project since spring have finally fallen to the persistent efforts of Transwestern and the producers who have stuck with the project and helped to make it feasible.

The construction go-ahead was given by Transwestern when all producers agreed to commit their gas ahead of the October 23 deadline set by the Federal Power Commission (OGJ, Sept. 28, p. 56). A spokesman for the new pipeline declared:

"We expect to be in business by next June, delivering 300,000 M.c.f. daily of gas to our California customers."

Contractors move in . . . With pipe having been delivered by June as a hedge against a steel strike and prime contracts awarded well in advance of FPC approval, contractors were ready to go to work this week.

Contractors are:

H. C. Price Co., Bartlesville, Okla., and Houston Contracting Co., prime contractors for 1,160 miles of 24 and 30-in. main feeder and trunk line in Texas, New Mexico, and Arizona, plus 300 miles of 10, 12, and 16-in. lateral lines in Texas and New Mexico. Houston will have three main-line spreads and Price will have two main-line spreads, with Price building the Arizona section.

R. H. Fulton & Co., Lubbock, Tex., has a subcontract for two main-line spreads and two lateral spreads in Texas and New Mexico.

Western Pipe Line, Inc., Austin, Tex., has one lateral spread under a subcontract in Texas.

Sheehan Pipe Line Construction Co., Tulsa, has most of the field gathering lines, some 250 miles of 4, 6, and 8-in. located in the Texas Panhandle, northwestern Oklahoma, Southwest Texas, and southeastern New Mexico.

Double jointing to speed construction has already started on the main line. Gathering-line construction will get under way in November. Contractors plan to work through the winter in order to complete the job by next summer.

Producer price hearings . . . Producers whose prices were conditioned at 1 to 6 cents below contract levels will have another chance to justify original prices.

Producers were scheduled to meet with FPC October 27 in advance of reopened hearings to present further data in support of contract prices. Producers have agreed in advance to accept whatever price FPC fixes.

Proposed prices of 23 cents an M.c.f. were cut to 17 cents in the Panhandle-Hugoton area for Humble Oil & Refining Co., Sun Oil Co., British American Oil Producing Co., Gulf Oil Corp., C. H. Vaughan, Jr., et al, Superior Oil Co., Magnolia Petroleum Co., Hunt Oil Co., and Warren Petroleum Co.

Union Oil Co. of California was cut from 20 to 16 cents in Eddy County, New Mexico. Richardson & Bass, et al, was cut from 21.8 cents to 18 cents in Winkler County, Texas. And Gulf Oil Corp.'s sale of Puckett-Ellenburger gas in Southwest Texas, representing 44.9% of the entire Transwestern supply, was cut from 12 to 11 cents.

Cities Service Gas Co., another supplier, refused to accept a conditional certificate.

PROCESSING BRIEFS . . .

Capacity of a polyethylene plant planned by Novamont Corp. at Neal, W. Va., has been doubled to 25 million pounds annually. Novamont, a subsidiary of Montecatini, the big Italian chemical firm, will start construction soon. The plant is due for completion in early 1961. When plans for the plant were announced last July, capacity was set at 11 million pounds annually. The Neal plant is Montecatini's first venture in the U. S.

A natural gas-processing plant, with a capacity of 50 million cubic feet daily, has been completed by Bay Petroleum Co. on Copano Bay, about 8 miles northeast of Rockport, Tex. Daily LPG output will be about 45,000 gal. In addition, a 13-mile 4-in. pipeline was completed from the gas plant to a products pipeline which Bay operates along the Texas Gulf Coast.

Refiners will meet in Tulsa December 1-2 for the second computer conference sponsored by Western Petroleum Refiners Association. New feature of the conference will be an equipment library where computer manufacturers will display data on their equipment. Hotel Tulsa will be headquarters.

A $4-million expansion of British American's giant gas-processing and sulfur plant near Pincher Creek, Alta., has been completed ahead of schedule, enabling the plant to meet planned increases in contract demands of the Trans-Canada pipeline. Based on a raw gas feed rate of 196 million cubic feet per day, the plant will recover 145 million cubic feet of residue gas, 24,500 gal. of propane, 31,400 gal. of butane, 5,300 bbl. of condensate, and 690 long tons of sulfur.

The U.S.'s largest refinery—Esso Standard Oil Co.'s 377,200-bbl. Baton Rouge plant—is holding its fiftieth anniversary celebration this week. Exhibits showing the progress of the refinery during its first half-century will be displayed through November 8.

Also for Refiners . . .

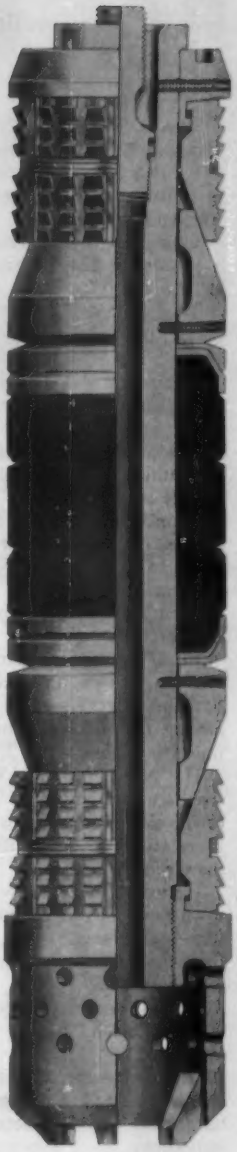
IN THE NEWS: Texas Railroad Commission plans to investigate products stock excesses (p. 45) . . . Isocracking process introduced to refiners as new tool to use in octane competition (p. 48) . . . Voyages prove gas by tanker is profitable (p. 52) . . . OCAW starts first labor talks with Humble (p. 58).

PLUS THESE TECHNICAL REPORTS: UOP has new way to treat high-mercaptan gasoline (p. 73) . . . Sun installs propylene unit tower (p. 105).

BETTER BRIDGING BENEFITS...
WITH
THE *NEW* HALLIBURTON

WIRE LINE

BRIDGE PLUG!



A *NEW* short – compact casing bridge plug... covering a wider range of casing weights than any other bridge plug used in the field today... has been engineered and developed by **HALLIBURTON.**

Designed primarily as a wire line set plug and constructed of "drillable" cast iron with rubber seal elements... can be applied – regardless of depth or pressure – to provide a positive fluid "shut-off" from either direction. Presently available in 5½" O.D. 13-20 lbs. casing size only. Other sizes under development.

√ CHECK THESE OUTSTANDING FEATURES:

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- Reduced premature setting
- Less drilling-out material when removed from well

★★★ PLUS THESE SUPERIOR CONSTRUCTION FEATURES

Expanding metal shoes on each end form a bridge and prevent packer rubber from extruding over wedges under high pressures.

Rubber packer protected from deteriorating well fluids.

Wedges and top slip supports are shear pinned to mandrel to prevent premature setting while running in.

Equipped with junk pusher as standard part of bridge plug.

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Halliburton Wire Line Bridge Plug is run on a sand or drilling line and set by either a Halliburton Hydraulic Wire Line Setting Tool or a Halliburton Cup Type Setting Tool... can also be used on electrical wire line – setting with Halliburton Powder Type Setting Tool.

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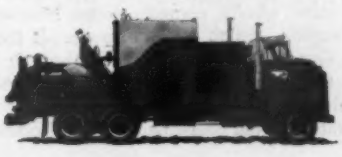

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OCAW Begins Humble Contract Talks

• Union in first meeting at Baytown refinery asks higher wages and correction of "inequities" in labor-management relations. Groundwork is being laid for bargaining agent election at Baton Rouge.

The Oil, Chemical and Atomic Workers Union presented its first set of contract proposals to Humble Oil & Refining Co. management over the weekend.

Union leaders expressed hope that a settlement can be reached without strife.

The OCAW is the newly named bargaining agent for employes at Humble's big Baytown refinery.

The union did not disclose its proposals in advance of the meeting but indicated it would ask for higher wages and the correction of certain "inequities" in labor-management relations at the plant.

Humble granted a 5% wage increase early this year but bogged down with the old Baytown Employes Federation on writing a contract to replace one which expired last December.

In a subsequent bargaining agent election, the OCAW won the right to bargain for some 3,160 workers among the 4,000 at the plant. The union said it now has 2,714 members.

H. W. Wier, OCAW representative assigned to union work at Baytown, said the union is pleased with its relations to date with the Humble management.

He said that manpower in the Baytown plant has been reduced by attrition—retirement, death, and resignation—and that the "situation is fairly well balanced."

Actual contract negotiations may start this week.

Election at stake . . . Meanwhile, at Baton Rouge, La., progress toward a bargaining agent election continued last week.

The National Labor Relations board held a hearing to determine which workers in the plant will vote in the election. Four unions will contest for the right to represent the bulk of the employes.

During the hearing, the NLRB representative, Fred Lewis, ruled that the bargaining unit should consist only of production and maintenance workers. The OCAW contended that technicians and clerical employes should be included and indicated it may appeal the ruling to the NLRB in Washington.

Represented at the hearing along with the OCAW were the Teamsters Union, the Baton Rouge Metal Trades Council, and the Independent Industrial Workers Union, all of which expect to be on the election ballot.

The Teamsters sought to step up their campaign by bringing President James R. Hoffa to Baton Rouge for a follow-up speech to one delivered late last spring. Hoffa drew only 300 workers, far fewer than he did on his first appearance. He used the occasion to attack the new Labor-Management Act passed by Congress and said it could "destroy organized labor."

Others on strike . . . On a third labor front, at Texas City, the 4-month-old strike of the OCAW against the American Oil Co. refinery continued without sign of a letup.

Contract negotiations broke down again after several days of fruitless effort by Federal Mediator James O. Hubbard to bring the union and management together.

The company is operating the plant with supervisors and is processing about 100,000 bbl. of crude daily. Plant Manager B. F. Babin said in a letter to the strikers last week that management has the responsibility of operating the plant efficiently and must "continue to be free to decide what work an employe may be assigned to do and to retain the authority to change assignments when conditions make such changes desirable or necessary."

The union seeks to keep job classifications intact unless it and management mutually agree to changes.

OCAW representatives also met without success with refinery management of Amoco's El Dorado, Ark., plant and of Indiana Standard's Sugar Creek, Mo., plant. A package settlement was proposed by the union at Sugar Creek.

One settled . . . Operations returned to normal at California Oil Co.'s 96,000-bbl. daily Perty Amboy, N. J., refinery.

A 9-day labor dispute which cut refinery operation by 50% was settled, and 700 members of the International Union of Operating Engineers, and Heavy and General Construction Laborers Union, went back to work with a new 1-year contract.

California officials described the new contract as "essentially" the same as the previous 2-year pact with the union except for the duration. No wage increase was involved, but the new contract has provisions for an improved annuity plan with the cost to be borne by the company plus a simplified grievance system.

The new contract calls for compulsory arbitration in any case in which the union objects to the company use of an outside contractor for work in the refinery.

PIPELINE BRIEFS . . .

Reorganization of Texas Illinois Natural Gas Pipeline Co., now owned 70.56% by Peoples Gas Light & Coke Co., Chicago, will be considered by TING stockholders November 12. TING and Peoples directors have approved a stock exchange whereby Peoples would acquire the remaining interest and TING assets would be transferred to a new wholly owned subsidiary of Peoples, called Gulf Coast Natural Gas Pipeline Co. Peoples hopes later to merge Gulf Coast with a sister company, the wholly owned Natural Gas Pipeline Co. of America. The purpose would be to improve flexibility in operation and development and cut expenses. TING runs from the Texas Gulf Coast to Chicago and Natural runs from North Texas to Chicago.

LPG terminals are planned at the origin and the terminus of the Oklahoma Mississippi River Products Line to permit first deliveries of the product through the Duncan, Okla.-West Memphis, Ark. system. Dean Moss, president of the newly formed Interstate Petroleum Corp., Memphis,

MUDHOLES won't mire this "aerial crane" as . . .

NORTHERN NATURAL sets pipeline weights by airlift.

Versatile Helicopter Now Sets Pipeline Weights

A NEW concept in pipeline construction is the use of a helicopter as an "aerial crane."

The versatile aircraft, well established as a transport and supply vehicle in the mountains and offshore, has taken on a new job on Northern Natural Gas Co.'s extension to Duluth-Superior.

The Sikorsky S-58 proved to be an economic solution to the problem of placing weights on the 20-in. line laid through Minnesota marshland, which would not support heavy cranes or sideboom tractors. Weights up to 3,000 lb. were handled quickly and with ease.

During 5 days on the job, the helicopter crew set almost 350 weights, sometimes at the rate of one every 2 minutes. Besides the pilot, there was one man in the helicopter directing the operation. Weights were lifted from a nearby stockpile and lowered onto the pipe, with two men on the ground using attached handles to guide them into position.

Pipeline Welding & Construction Co. was the contractor.

Russians do it, too . . . American pipeliners aren't the only ones who have been intrigued by the possibilities of this new concept—the Russians recently used helicopters for an identical application.

Big twin-rotor helicopters ferried reinforced concrete blocks into swamp areas of peat bogs in the Novgorod area on the newly completed gas line to Leningrad. Up to 880 lb. of concrete per meter of pipe was needed to keep the line at the bottom of water-filled trenches.

The 500-mile line is the first major gas line completed under Russia's new 7-year plan. It is a northward extension of the 807-mile system from Stavropol, in the northern Caucasus, to Moscow. The original line began operations 3 years ago.

Tenn., said 30,000 bbl. of storage would be constructed at West Memphis and 50,000 bbl. at Duncan. Total cost would be $1,750,000. Moss said the company planned to load 100,000,000 gal. of LPG during the first year of operating the terminals, starting about June 1, 1960.

A 43-mile gas-gathering system in the Husser area of Alberta has been completed by Banister Helm, Ltd., for Tennessee Gas Transmission Co. of Canada. The system consists of 2 through 8-in. pipe.

An 8¼-mile 16-in. line has been contracted to Sam Carline, Inc. Berwick, La., for United Gas Pipe Line Co. The project is located in Terrebonne Parish, Louisiana.

A 14-mile 16-in. line to be built for El Paso Natural Gas Co. has been contracted to Eastern Pipeline Contractors, Dallas. Construction is scheduled to start this week on the line near Tempe, Ariz., in the Phoenix area. The project will be used to deliver gas to a steam electric generating plant now under construction.

Also for Pipeliners . . .

IN THE NEWS: Gas line planned to link Kenai field with Anchorage (p. 55) . . . Pipe laying to begin on Transwestern gas line from Texas to California (p. 56) . . . Michigan Wisconsin Pipeline Co. challenges new Texas gas tax (p. 61).

Pipeline construction report will be found on p. 106.

PLUS THIS TECHNICAL REPORT: Variable-speed drive cuts power costs (p. 79).

He knows Rolo equipment. He can show you the advantages of continuous well data made possible through individual well metering. He can prove to you the economies of combining metering with separation or treating, in one vessel. He can also acquaint you with the many advantages of the Rolo method of natural gas dehydration using calcium chloride.

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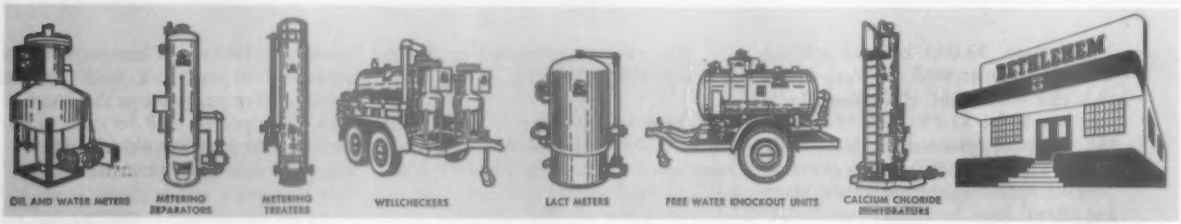

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Gas Line Challenges New Texas Tax

TEXAS' new severance beneficiary tax on natural gas was attacked in court last week by Michigan Wisconsin Pipeline Co.

The tax, at a rate of 1.5% of value to be paid by the first purchaser of gas produced in the state, was passed by the legislature last summer and went into effect in September.

The tax was strenuously resisted by pipeline companies and was passed only after a long fight.

Michigan Wisconsin's suit, filed with the 126th District Court in Austin, contends primarily the tax is unconstitutional and an unlawful attempt to invade the field of interstate commerce.

Along with this, the tax is "arbitrary, discriminatory, vague, indefinite, ambiguous, and incapable of determination . . . among other things," the suit argues.

Though the Michigan Wisconsin suit is the first filed against the tax, it is not expected to be the last. Those hit by the levy, which is expected to bring in roughly $15,000,000 in 1960 and 1961, have until October 31 to pay it on gas bought in September.

As did Michigan Wisconsin, other large gas pipelines are virtually certain to pay the levy under protest. This is insurance that they will get the money back if the tax should be overturned by the courts. Several of the largest pipelines did not pay under protest and had great difficulty in getting their tax money returned when a previous Texas effort to tax the long lines was declared unconstitutional in 1954. They are not likely to make this mistake twice.

Many of them also will file suits to upset the tax, rather than wait on the outcome of the Michigan Wisconsin case. Assurance of this came from R. Dean Moorhead, Austin attorney, who filed the suit for Michigan Wisconsin. Moorhead said he would file similar suits for several other firms before the end of the month.

Michigan Wisconsin's pipeline system barely edges into Texas in Hansford County in the Panhandle. The company buys residue gas from Phillips Petroleum Co. at the outlet of that firm's gasoline plant just 1.7 miles from the Oklahoma border. All the gas is sold outside Texas, with the southernmost market at Mound City, Mo.

Daniel blasts suit . . . The Michigan Wisconsin action was immediately assailed by Gov. Price Daniel, an ardent backer of the tax, as an effort by natural-gas lines to avoid paying their fair share of state taxes.

"The long-line gas companies fought hard against accepting any of the tax load and some of their lobbyists were in the front ranks of those who worked for a general sales tax rather than even this small tax on their own dedicated reserves."

The Governor said the suit came as no surprise since "we have been threatened in the legislature." He expressed confidence that the Texas attorney general would be ready to meet the attack.

Paid in Full

THE STATE of Texas has received only one payment under its new severance beneficiary gas tax that was not filed under protest.

Nash & Windfohr, Graham, Tex., independent operator, last week paid Comptroller R. S. Calvert the tax it figured it owed for September operations. It amounted to 5 cents.

NPC Would Revise Crisis Mobilization Plan

- **Interior is urged to clarify the status of executive reservists, define authority for national emergencies.**

THE NATIONAL Petroleum Council has recommended several changes in the plan proposed by the Interior Department's Office of Oil and Gas for handling oil and gas problems in a national emergency.

The NPC, asked by Interior to study its tentative plan, made its report at a meeting in Washington last week.

The NPC committee which drafted the report said that while in general the proposed plan appears to be a good one, it does have some "fundamental defects." Therefore, the committee suggested these changes:

. . . Government organization. The plan should specifically provide that all oil and gas operations be handled by the Department of Interior, but organized so that the Secretary of Interior would be the administrator, responsible directly to the president.

The mechanical operations would be in the hands of a deputy administrator "of wide oil and gas experience." (This would be similar to the setup under which the PAD operated during the Korean emergency.)

. . . Legal clearance. Cooperative efforts under government supervision should receive prompt clearance from the Department of Justice.

In addition, the plan should specify in advance an adequate legal basis for implementing emergency plans and for conducting activities called for under the plan.

Finally, the legal status of executive reservists during the standby peacetime period should be clarified.

. . . Boundaries of authority. The plan should be more specific about federal, state, and municipal jurisdiction in handling oil and gas problems in an emergency. Too, it should identify the role of any other government agencies which might become involved.

. . . Geographical boundaries. Because of normal operational patterns and procedures for reporting statistics by the oil industry, the committee recommended that the oil plan follow the boundaries of the PAD districts rather than the geographical regions of the Office of Civil and Defense Mobilization.

. . . Implementation. The plan should cite the conditions under which various phases of the plan should go into effect so there would be a minimum of delay and confusion during an emergency.

. . . Personnel. The NPC also, at the government's request, submitted a list of industry men qualified to serve as executive reservists.

In addition to its report on emergency mobilization, the NPC heard interim reports by its committees studying petroleum-storage facilities and the use of radio and radar.

Arkansas Gas Due Boost

. . . with completion of Arkla's $6-million line from Aetna field to Perla. Extension also planned east to Helena.

COMPLETION of a 95-mile 16-in. pipeline by Arkansas Louisiana Gas Co. will open up wider markets and spur development of western Arkansas natural-gas reserves.

Arkla is ready to start operation this fall of its $6-million line originating in the Aetna gas field and extending southeast to its main line at Perla junction near Malvern.

The company's first line into the area, a 10-in. trunk originating in Cecil field, was built in 1928. The area will be boosted further next year when an Arkla subsidiary, Arkansas Industrial Pipeline Corp., builds a 130-mile 18-in. extension from Perla junction to Helena, Ark., to serve a new Arkansas Power & Light Co. plant which will start operating in 1961.

New line . . . Capacity of the Aetna-Perla line without main-line compressors is some 60,000,000 cu. ft. daily, the same as the old 10-in. line, providing a capacity from western Arkansas of 120,000,000 cu. ft. per day.

When compression is added, the new line will be capable of handling up to 180,000,000 cu. ft. per day at 1,000 psi., raising capacity from the area to 240,000,000 cu. ft. per day.

It will provide additional supplies for domestic and industrial customers and towns along its route. Near the connecting point to the Arkla system in central Arkansas are some of the company's largest industrial customers, including Aluminum Co. of America, Reynolds Metals Co., and Arkansas Power & Light.

Reserves acquisition . . . W. R. Stephens, chairman and president of Arkla, said his company, which also has been a western Arkansas gas producer for 31 years, began an active program of gas buying in the area 4 years ago.

The new line and increased contract prices to producers have encouraged further exploration in the Arkansas Valley.

"We have acquired a majority of gas reserves in all major fields discovered during the past few years in the upper valley," Stephens said. "ALG is awaiting further development of additional wells to prove sufficient reserves to justify construction of unusually expensive gathering systems in the mountainous terrain."

The area is attractive to the company because gas is close to the heart of its marketing area. Since gas is sold intrastate, prices are not subject to federal control.

In recent years Arkla has contracted reserves under some 100,000 acres in the Arkansas Valley. The most recent deals cover Jerusalem and Old Hickory fields in Conway County, Dover and Knoxville fields in Pope County, Quitman field in Cleburne County, and Hartman field in Johnson County. All will be connected to the system by the end of 1959.

A $500,000 gathering system for Jerusalem will increase reserves connected to the line by about 30 billion cubic feet.

Aetna field . . . The local market in the Fort Smith area has permitted good gas takes from Aetna for the past 18 months.

Construction of the line to Perla, and the extension to Helena, will further improve prospects for the entire area.

Operators in Aetna field include Athletic Mining & Smelting Co., Fort Smith; Carter Oil Co.; and Continental Oil Co. There are 10 wells completed and 4 more drilling in Aetna.

INDUSTRY BRIEFS . . .

Mobil of Canada is seeking 320-acre spacing for oil development in Carson Creek North field near Whitecourt, Alta. If approved the plan would give Alberta its third oil development on 320-acre spacing. Virginia Hills was the first, under a temporary order expiring December 1. The other is in the Carium pools in the general Garrington area. Hearing on Mobil's applications has been set tentatively for November 5. Mobil's reasoning is simply that 320-acre spacing will drain the reservoir.

Midland, Tex., is all set to kick off its big Permian Basin Petroleum Pioneers Day celebration October 28. The celebration is sponsored by the Midland Chamber of Commerce as the community's part in the nation-wide observance of oil's 100th anniversay. The day has been set aside to honor those who participated in the oil industry in the Permian basin area prior to October 1, 1929. Invitations have been sent to more than 1,000 oil men.

Gulf Oil Corp. will have 150 new service stations in Florida by early 1960. Construction on the first station has begun in Pompano Beach. Arvida Oil Co. will build and operate the stations for Gulf.

Four major oil companies have bid $1,239,513 for exploration rights near the boundary of British Columbia and

Foes of Small-Tract Drilling Lose in Court

THE TEXAS Supreme Court has upheld a small-acreage drilling permit in the Port Acres, Tex., gas field, but the ruling does not affect a still-pending case involving waste through loss of pressure in the field.

The court approved the Texas Railroad Commission's application of Rule 37, whereby a well can be drilled on a tract smaller than the spacing unit approved for the field. Such wells are permissible if the small tracts are individually owned.

The ruling knocked out an appeal by Michel T. Halbouty, Pan American Petroleum Corp., and others who had challenged a Rule 37 permit granted to W. G. Darsey, Jr., to drill on 0.48 acre. The regular spacing is 160 acres.

Halbouty had carried the case through the District Court at Austin and the Court of Civil Appeals to the Supreme Court. Attorneys argued that small-tract drilling in the prolific field near Port Arthur was causing drainage of adjacent property and that the cost of the well exceeded the value of the minerals under the lease.

The spacing unit at Port Acres is 160 acres, but a large number of small tracts in the community area have been drilled by independent operators (OGJ, Oct. 5, p. 108).

The allowable formula, based on one-third for the well and two-thirds for the acreage, grants wells on the tiny tracts one-third the allowable for those on 160 acres.

Another case filed by Halbouty, Pan American, and Meredith & Co. tests another aspect of small-tract drilling and is still pending in District Court at Austin (OGJ, Aug. 31, p. 28).

Attorneys said the court decision will not change the company's determination to prosecute the second lawsuit, which seeks to force the Railroad Commission to unitize the field for purposes of recycling gas and thus keeping up the pressure.

The major producers in the field want to build a $7-million cycling plant to increase recovery by 7,136,000 bbl. of liquids. They claim that excessive drilling is lowering the reservoir pressure and causing loss of condensate by retrograde condensation.

The suit also seeks to change the allowable formula to one based strictly on acre-feet.

No date has been set for the case to go to trial. An attorney for Halbouty said last week that a number of companies plan to intervene.

In still another case pending on the same subject, Pan American seeks to knock out all 24 permits granted for small-acreage drilling in the Port Acres field. While the court's latest ruling appears to bear directly on the issue raised, attorneys said that each Rule 37 permit must be judged separately and therefore is subject to attack by the opposition.

Heating Stations Help Move Heavy Crude

A 30-MILE pipeline being built for Honolulu Oil Co. in Wyoming is designed to move crude heavy enough during cold weather to be scooped up with a shovel.

The 6, 8, and 10-in. line runs from Fourbear field to Platte Pipe Line Co.'s Oregon basin station. Some of its interesting features:

...The 13°-gravity crude will go into the line at the field under LACT control and will discharge into the Platte line under control of a complete ACT system.

...To move the 150,000 S.s.U. viscosity crude, it will be heated three times over the short 30-mile stretch, raising the temperature from 45° to 190° F.

...The line is telescoped upward to prevent loss of capacity when the temperature of the crude drops.

When the crude enters the LACT unit, it will be heated to 190° F. by 15-psi. steam boilers. As the crude moves through the line—which will be buried just below the frost line—it will cool to 90° F. every 10 miles. Additional heating units spaced at the 10-mile critical intervals will reheat the crude to 190° F.

By heating the cude to 190° F., its viscosity will be reduced from 150,000 S.s.U. to 380 S.s.U. The viscosity will build back up to more than 7,000 S.s.U. by the time the crude has traveled to the next heating station. This was computed on the basis of a 400-bbl.-hourly flow.

Initially, the line will have a designed capacity of 10,000 bbl. daily.

The unique line was designed by Sesler & Associates, Los Angeles, and is being built by Pease Bros. Co., Vernal, Utah. It will probably go into service in December.

Northwest Territories. The zone is about 45 miles north of this boundary and midway between Fort Providence and South Nahanni. Shell Oil Co. of Canada, Ltd., was top bidder at $463,858 for two parcels.

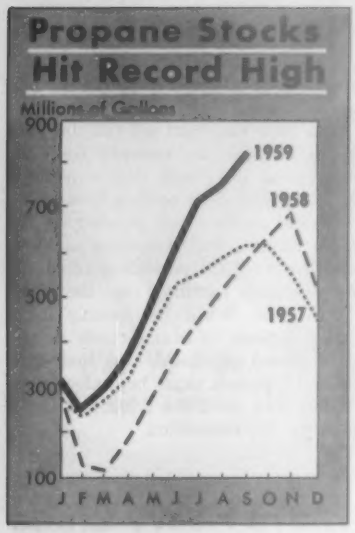
Mobil Oil Co. will sell the Magnolia Petroleum Building in Houston and may erect a larger building to house its expanding operations. The three-story Magnolia building is now occupied by Mobil's marketing district personnel.

Louisiana's production allowable formula will remain for November and December at a level unchanged since September 1958. Chief Engineer Tom Winfield estimated that production probably will rise about 10,000 bbl. daily because of new completions. The depth bracket formula will be the same as in the past.

Houston oil men staged an appreciation dinner last week for Texas' long-time railroad commissioner, Ernest O. Thompson. Several hundred friends turned out at the testimonial affair and heard Thompson respond with an address on the growth and functions of the Railroad Commission.

Water flooding of the 35,000-acre Northeast Purdy unit in Garvin County, Oklahoma, is expected to begin in December with Cities Service Oil Co. as operator. The project, which will cost $15 million, will recover an estimated 85 million additional barrels of oil. Drilling of four water wells and conversion of 43 wells to water input is scheduled in 1960. Eventually, four water treating plants and seven lease automatic custody transfer units will be installed to serve the unit.

Alberta crude-oil output will drop from 338,819 bbl. daily in October to 322,353 bbl. in November. A 4,500-bbl. increase in exports to the U. S.—for a total of 46,500 bbl. daily during November—is not enough to offset a sharp decrease in Ontario demand. Ontario refineries are seeking 93,300 bbl. daily, a decrease of 38,900 bbl. per day from October.



Propane Stocks Up

. . . to highest level. Most is in underground storage.

PROPANE stocks are at an all-time high, with inventories totaling 820,493,000 gal. at the end of September.

Total stocks represented a gain of 236,000,000 gal., or 40% over stocks at the same time last year, according to the American Petroleum Institute.

The API report covers inventories at plants, refineries, terminals, and underground. It shows underground storage accounts for 744,519,000 gal., or 91% of all propane stocks.

The continuing increase in available underground-storage space has led to increased production of propane.

Also, in the past butane and propane often were stored as a mixture. The big demand for butane at refineries and chemical plants has caused processors to strip out the propane and store it separately.

The API's report shows stocks of all other LP-gas products increased 70,000,000 gal., or 21% over stocks on hand at the end of September last year.

Utah Hit Taps Mississippian

UTAH'S SECOND Mississippian producer is Pure Oil Co.'s 1 Northwest Lisbon in 10-30s-24e, San Juan County.

This important gas strike is also the third Mississippian producer in the entire Paradox basin. A drill-stem test in Mississippian at 7,543-7,643 ft. got a gas flow of 3,310 M.c.f. daily after 5 minutes and at end of the test 5,000 M.c.f. daily.

Coring continues below 7,643 ft. This discovery prospect is 29 miles southeast of Cane Creek and 40 miles southeast of Bif Flat, the sole Mississippian producer in Utah. The Big Flat strike 3 years ago set off a brisk look into Mississippian prospects, but met with failure on all fronts.

Shale Plant Sought

. . . by expert. Claims oil recovery at $1.75 per bbl.

DR. TELL ERTL, shale-oil expert, says he can produce 25,000 bbl. of shale oil daily at $1.75 per bbl.

Ertl wants to build a $20-million shale plant near Grand Valley in western Colorado's Piceance Creek area. But he needs outlets for his product before he can get the necessary financing.

Ertl says he is making the offer of $1.75 per barrel to get the oil companies interested. He is convinced shale oil can be produced in western Colorado for less than the price of crude.

One major company is interested in his proposal, Ertl says, "and I've just begun contacting others."

Ertl formerly was an engineer at the U. S. Bureau of Mines shale-oil experimental station at Rifle, Colo., and a consultant to Union Oil Co. of California. Union closed an experimental plant near Grand Valley last year.

Denver Gas War Rages On

DENVER'S gasoline war continues unabated.

District Judge Edward Keating, Denver, has dismissed a suit for a price-cutting injunction filed by Oriental Refining Co., Denver. Ruling in favor of 19 gasoline distributors, he declared the state's Unfair Practices Act unconstitutional. He said the act's clause prohibiting below-cost sales is "vague and indefinite" and violates the Fourteenth Amendment.

Oriental had filed suit under a Colorado law which prohibits below-cost sales aimed at destroying competition. The company sought an injunction to halt the price war, which has toppled prices for regular gasoline in the Denver area to 22.9 cents.

The distributors argued that the law had never been enforced, that a ruling in 1955 by a Denver district judge declared it unconstitutional, and that it is illegal despite the fact it has been upheld four times by the Colorado Supreme Court.

Gas Edict Stands

. . . as court shuns Kansas price review. Refunds due.

THE 5-YEAR FIGHT by the Kansas Corporation Commission to enforce a minimum price of 11 cents per M.c.f. on the field price of natural gas produced in that state has run into a fresh rebuff by the U. S. Supreme Court.

The U. S. court has refused to review a decision by the Kansas Supreme Court which held that the price order was invalid from the beginning.

This raises the big problem of refunds—of perhaps as much as $60 million—of rates collected since the 1954 order was issued.

Some pipelines had been paying as little as 3½ cents when the Kansas commission imposed the 11 cent minimum in 1954 as a conservation measure.

The commission's order was upheld originally in Kansas courts but the U. S. Supreme Court overruled them in 1958. Its recent denial of a review apparently closes the matter as far as the U. S. court is concerned.

Refinery Delayed

. . . until Frontier finds answer to supply problem.

CONSTRUCTION of Frontier Refining Co.'s $10.5-million refinery near Jacksonville, Fla., is being delayed until a supply of crude oil can be assured for the crucial first year of operation.

P. A. Kahle Jr., manufacturing vice president of Frontier, says a date for beginning construction has not been set because the company has not solved the "economic supply problem" involved in keeping the planned 10,000-bbl. refinery operating at top efficiency. A refinery in the Jacksonville area would have to use a substantial amount of foreign crude to operate economically, Kahle says, but import regulations prohibit a new refinery from importing crude until it has been operating a year.

Kahle says his firm hopes to obtain a change in the import regulations or work out a competitive arrangement for some domestic petroleum stocks.

Frontier, a Denver-based operation, has been seeking a refinery site in Florida for more than 7 years. The site it plans to use covers 122 acres on the St. Johns River.

Third Time May Be Charm for Pakistan

- Karsal 3 has oil show.
- It's the third test in 3 years on the structure.

THE FRUSTRATING search for oil in Pakistan may have taken a turn for the better with an "encouraging show of oil" in northern West Pakistan.

Pakistan Petroleum, Ltd., encountered the show in Karsal 3, a deep test in the general region where four small fields produce commercial amounts of oil at medium depths. The find is about 250 miles north of the company's Sui gas field, the biggest prize so far in the search for oil and gas.

Oil was encountered at 11,664 ft. in Eocene limestone. Production tests are now in progress.

Karsal 3 is the third deep test on the structure in the last 3 years. Karsal 1 was completed at 12,751 ft. in 1956 as a small producer from a limestone section. The well since then has intermittently produced small amounts of oil.

Karsal 2 was abandoned last year at 12,676 ft. Pakistan Oilfields, Ltd., a partner in the test, said the well penetrated the full range of limestones without meeting permeability capable of yielding commercial production.

Hunt withdraws . . . Eight companies have poured exploration money into West Pakistan without finding major oil. Existing production of 5,900 bbl. daily comes from fields found between 1915-57.

Ironically, gas, for which there is little need, has been found in several places, and a pipeline system from Sui field is now in operation.

Hunt International, which has drilled 11 wells and 2 joint tests since entering the country in 1955, is giving up its drilling operations in West Pakistan. The company found gas, but it was not developed.

The company's drilling equipment is being shipped to Libya. It will continue surface work in Pakistan.

Oil Moving From Peru's Maguia Field

COMMERCIAL production has started moving from a small field in the jungles of eastern Peru.

Maguia field is producing 100 tons, or about 750 bbl. daily, of light crude from 10 wells that have been drilled in the past 2 years by a joint Peruvian-German company.

The crude is moved under its own pressure through a 7-mile pipeline laid through the jungle to the Ucayali River, one of the sources of the Amazon. Special, shallow-draft lighters pick up the oil from storage at the river's edge. These are pushed 1,740 miles downstream by tug to Manaos refinery, located on Rio Negro, a branch of the Amazon.

Production tests on a commercial basis will be conducted for several months to establish the life of the reservoir.

Three German firms, DEA, Gewerkschaft Elwerath, and Wintershall, together with a local company, El Oriente, made the Maquia find in the upper reaches of the Ucayali in 1957.

The reservoir is an anticlinal fold with five productive horizons of upper Cretaceous sugar sandstone lying between 1,700-2,100 ft. Surface work is in progress in other areas of the concession.

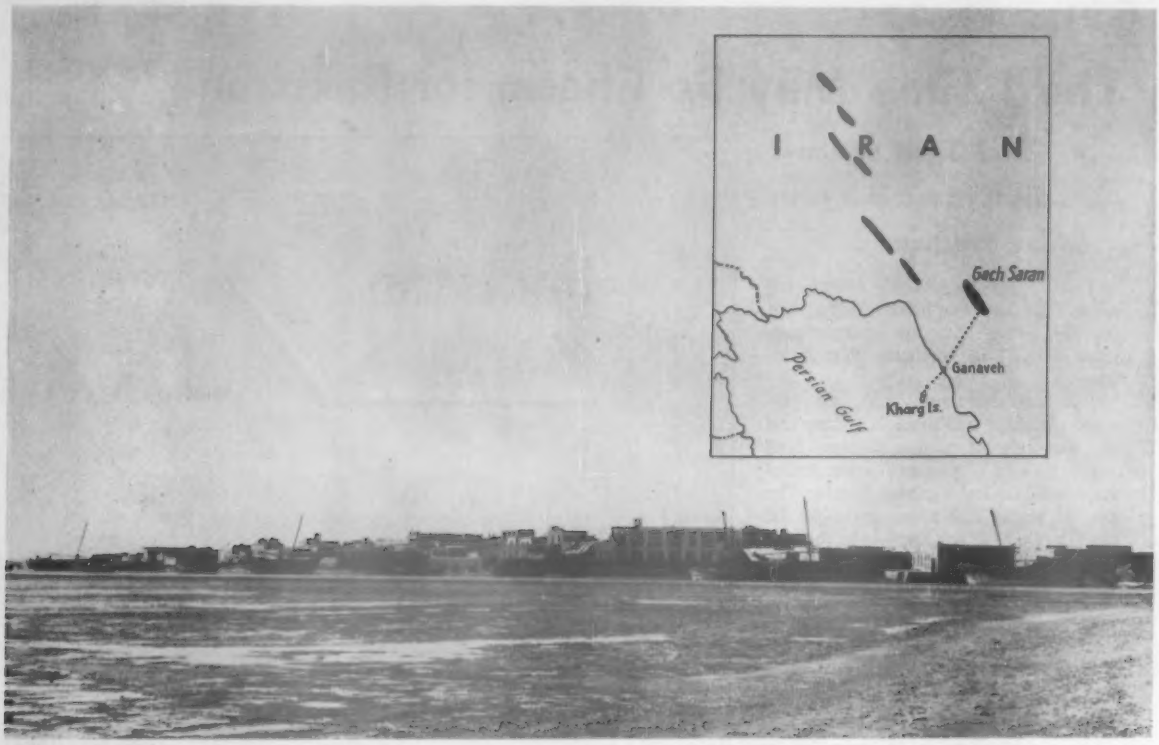
Work to Resume on Jap Well

DRILLING on the trouble-plagued Japanese wildcat in the Persian Gulf, 25 miles off the Neutral Zone, will be resumed within 30 days.

The Arabian Oil Co. well, spudded July 19, blew out and caught fire 2 weeks later and burned 9 days when the bit struck a gas pocket at 1,500 ft. Rig and auxiliary equipment were destroyed with damage estimated at nearly $1,000,000. In addition to the gas, there were some indications of oil when the well blew out. (OGJ, Aug. 10, p. 80, and Aug. 17, p. 117).

J. W. (Jack) Bates, Jr., president of Reading & Bates Offshore Drilling Co., said replacement equipment was to arrive at the site last weekend. Drilling should be resumed between November 15 and December 1, with contractor using the same hole.

Only minor damage was done to the C. E. Thornton, R&B's LeTourneau-type mobile platform. Repair work has been under way 2 months. The well is projected to 8,000 ft. to test the Jurassic Arab zone. International Drilling Co. of Rome, contractor, hopes to complete the well within 90 days.



FISHING VILLAGE of Ganaveh along the route of the pipeline from Gach Saran to Kharg Island.

Tiny, Historic Kharg Island Becoming

• Multimillion-dollar program is turning 5½-by-2-mile island into modern oil-loading terminal. The facilities are being linked to Iran's Gach Saran field by a 99-mile pipeline.

Paul Swain
International Editor

IT'S NOT often that the development of a single field in a country that has been producing oil for more than 50 years calls for the multimillion-dollar construction of a new loading terminal.

That's what's taking place in Iran today and all because of the intensive development of Gach Saran, a field that is more than 30 years old. Conversion of historic Kharg Island to an oil terminal and linking it to the field with a 99-mile 26, 28, and 30-in. pipeline account for the bulk of a $140-million construction program in Iran.

The known history of Kharg Island, a 5½-by-2-mile chunk of sand and rock off Iran's coast, goes back to the days before Christ. Alexander the Great once landed troops on the little island and it has been prominent several times in centuries of Middle East history as a trading and commercial center.

Until construction crews swarmed over the island more than a year ago, it was used chiefly as an exile and prison for Iranian political prisoners. There were only about 600 people on the island, farming small plots of arable land and fishing for food. Today there are another 2,500 inhabitants who are literally changing the whole face of the island and making it a modern oil-lifting terminal.

The 26-28-in. is being snaked across 71 miles of mountainous desert and extremely rough country to a point on the Persian Gulf coast near Ganaveh. The line is being built by Williams Brothers, Tulsa.

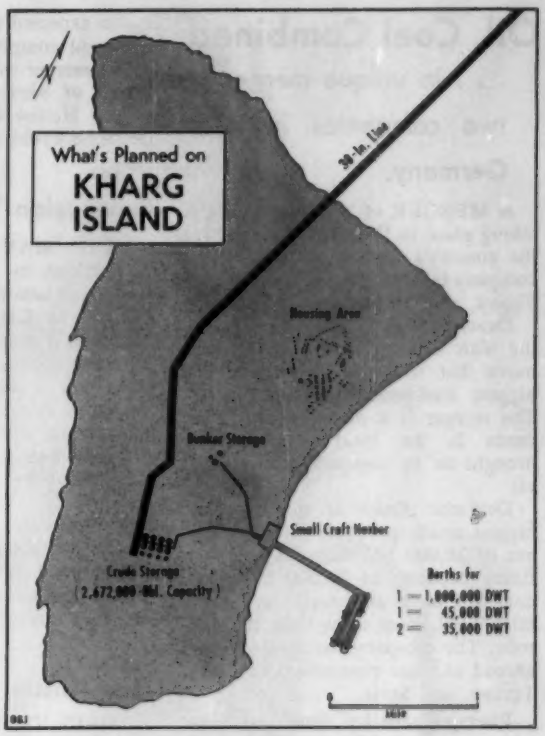
At the coast a 26-mile link of submarine 30-in. will be strung southwest to, and across, the little island of Khargu and then 2 more miles to the tank farm on Kharg Island's highest elevation. Initial throughput of 390,000 bbl. daily will come from the 2,550-ft. Gach Saran field to the 500-ft. tank farm by gravity flow. When later development of the producing facilities at the field boosts this to 450,000 bbl. daily and more, it will be necessary to pump the line.

In what is a unique pipelining operation, Collins Submarine Pipelines (Overseas), Ltd., will pull the 30-in. submarine line from Khargu to Ganaveh in one big pull-and-weld operation.

The line is welded in 4,000-ft. lengths on the small Khargu island and then pulled 4,000 ft. at a time, relying on negative buoyancy of the cement coated pipe to do most of the work. This submarine section of the line will be under 150 ft. of water most of the 26-mile distance.

The tank farm's 2,672,000 bbl. of storage will consist of eight 254,000-bbl. tanks and four which will hold

PIPELINE-welding operatings being performed on Khargu Island, 2 miles north of Kharg. The 30-in. line is being welded in 4,000-ft. lengths. Next step in laying the line was the big pulling operation.



Oil Terminal

160,000 bbl. The four-berth jetty now under construction will be served with twin 38-in. loading lines from the tank farm.

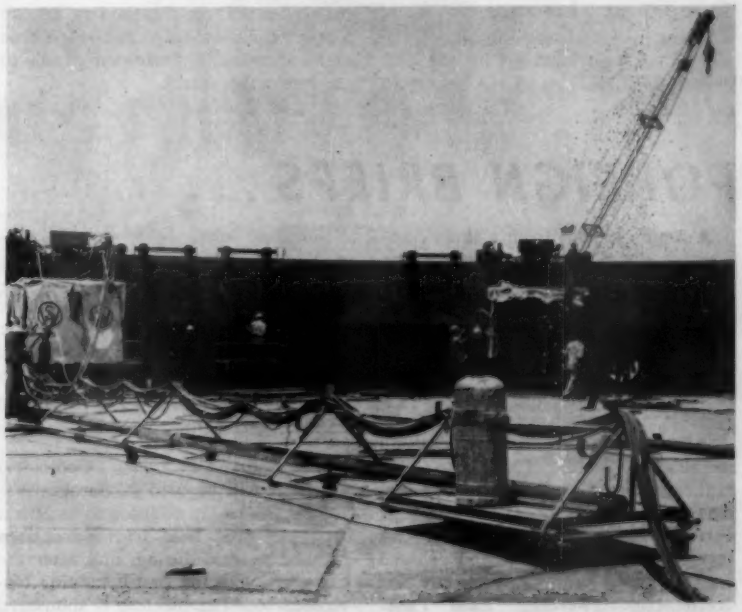
The jetty, in 60 ft. of water, will be able to accomodate one 100,000-ton tanker, a 45,000-tonner, and two of 35,000 tons at the same time with turnaround time for the biggest tanker less than 20 hours.

The terminal will be served by a 1,480-ft. causeway as the base for a 2,000-ft. trestle jetty 120-ft. wide extending into deep water on the sheltered east side of the island.

Building the terminal and making it a permanent installation has meant literally building a town with all the necessary facilities to support the people who will operate it. This will include a 3,000 kw. power-generating plant and a sea-water distillation plant to convert 300,000 gals. of brine to fresh water daily.

The Kharg Island terminal is already shaping up as a real rival to Bandar Mashur as Iran's prime crude outlet. It looks so good, in fact, that the new oil companies now exploring Persian Gulf waters off Iran are casting hopeful eyes at the shipping location long before they have found any crude to ship.

The Iranian Government has pointed out that the island terminal may be used by more than one company, but Iranian Oil Exploration & Producing Co., which is building the installation for its own use, is noticeably unenthusiastic about such a prospect. The consortium company has designed the terminal for future expansion for itself and confidently plans to use all the available space.



MAKING horizontal weld in one sweeping action is an automatic welding machine being operated inside a 254,000-bbl. tank on Kharg Island.

Oil, Coal Combined

. . . in unique merger of two companies in West Germany.

A MERGER of a different type is taking place in West Germany, where the country's biggest independent oil company is combining with one of the biggest coal producers.

Deutsche Erdol, A. G., is combining with Rheinpreussen, A. G., in a move that will give the country its biggest fuel-producing organization. The merger is a direct result of the crises in the local coal industry brought on by competition from fuel oil.

Deutsche Erdol is the country's biggest crude producer with an output of 20,000 bbl. daily. It has a refining capacity of 30,000 bbl. daily and will have an interest in a new 80,000-bbl. plant to be built at Karlsruhe. The company has also ventured abroad and has concessions in Libya, Turkey, and Syria.

Rheinpreussen has four coal mines which produce 5% of the country's coal. One of these is scheduled to be closed down.

Both companies have nation-wide chains of gasoline retail outlets. For the time being, these will continue to operate under their present trade names, taking products from Deutsche Erdol refineries. Both firms also have research and development organizations in the petrochemical field. These will be coordinated.

Deutsche Erdol has one coal mine, which has been hard hit by the coal depression. This side of the operation is also expected to become more efficient and competitive.

The merger will be made by an exchange of Rheinpreussen shares held by the Haniel family in return for Deutsche Erdol shares.

Venezuelan Test Stopped

WHAT MAY be the deepest well ever drilled in Venezuela has been abandoned below 16,000 ft. in Barinas Province by King Mill Oil Co.

Socopo 2 was suspended at 16,070 ft. in the northwest corner of Barinas Block 26, a 49,420-acre concession for which King Mill paid $15.5 million 2 years ago. The location was 6 miles southwest of Bumbum 1 wildcat, drilled by Venezuelan Atlantic on Block 27.

The company had planned to drill Socopo 3 at a site 2½ miles northeast of Socopo 2, but the test was called off on the basis of results from the first two wells.

New Aussie Search Planned

THREE STATES Natural Gas Co., Dallas, has acquired a 6,400,000-acre concession from the Australian Government in the Northern Territory of Central Australia.

Provisions of the agreement bind Three States to conduct geological and seismic exploration on its concession within the next 6 months.

The agreement does not specify a minimum amount of money which the company must spend to hold the concession. Three States has set up a new wholly-owned subsidiary, Three States Australian Petroleum, Ltd., to carry out the search.

Mixing Operation

. . . to be simple at Ghawar miscible-phase project.

ARAMCO is spending $8 million to build facilities for a miscible-phase displacement program in Ghawar field, but the actual above-ground mixing of LPG and natural gas will be simplicity itself.

About 37,000 bbl. daily of raw LPG will be injected directly into a natural-gas line, without any special mixing mechanism. The only difference will be that the gas line will be of larger diameter.

The mixture of LPG to gas is expected to average 407 bbl. of LPG for each million cubic feet of natural gas on a yearly average. Actual proportions at any given time will vary with the seasons. The mix will be injected into three wells in north dome of 'Ain Dar section, Ghawar field.

Aramco plans to install a 14,500-hp. gas turbine to drive three centrifugal compressors that will raise the LPG to 2,100 psi., the same pressure as gas from a new compressor plant at 'Ain Dar. This plant reinjects up to 210 million cubic feet daily into five wells on 'Ain Dar's north and south domes.

Spheroid and stabilizer gas collected from 'Ain Dar and Abqaiq field will be processed at a compressor plant to be built at Abqaiq. This will be sent to 'Ain Dar through a 30-mile 8-in. pipeline.

The project will probably be the world's largest miscible-phase drive program when it goes into operation in mid-1961. (OGJ, Oct. 12, p. 103).

FOREIGN BRIEFS . . .

A 2-mile stepout from a small commercial gas field in southwestern France has come in as a producer. Charlas 1, drilled by RAP, tested 70,000 cu. ft. per hour of wet gas from 7,100 ft. The well is northwest of the 21-year-old St. Marcet field, in Aquitaine basin.

Atomic-powered propulsion may be installed in an old 15,000-ton class tanker now laid up in West Germany. The vessel would not be used for carrying commercial cargo, but to test an atomic drive being developed by a German firm, Gesellschaft Fur Kernenergieverwertung. Esso Tankschiff, owner of the ship, "Esso Bolivar," is negotiating the sale.

Site has been picked at Mohammedia on Atlantic coast 19 miles from Casablanca for 25,000-bbl. daily refinery of Soc. Anon Maroc-Italienne, jointly owned by Ente Nazionale Idrocarburi and Moroccan capital. Deadline for bids on the project is November 30. Completion is scheduled for late 1962.

The third Venezuelan Geological Congress will be held in Caracas November 22-29. In addition to technical sessions, three field trips have been planned before, during, and after the Congress, with the first beginning November 16. The meeting is sponsored by the Venezuelan Society of Geologists and the Ministry of Mines and Hydrocarbons. Registration ($30 fee) closes November 22.

Construction will start this month on a supertanker terminal at the Europoort area near Rotterdam. Caltex Petroleum, Mij., will build the terminal. It will be connected to Caltex' 49,000-bbl. Pernis refinery by a 12-mile 24-in. crude line. The terminal eventually will be able to handle tankers in the 100,000 dw. tons class.

A Guatemalan concession of 750,000 acres has been taken by Artnell Co., Chicago. Located in the Department of Escuintla, it was turned to Artnell by Fred Ayesh, Wichita, who retains an override. Ayesh said he has an additional 900,000 acres adjacent to the Artnell acreage.

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Illustrated: 400 pound pressurized dry chemical.

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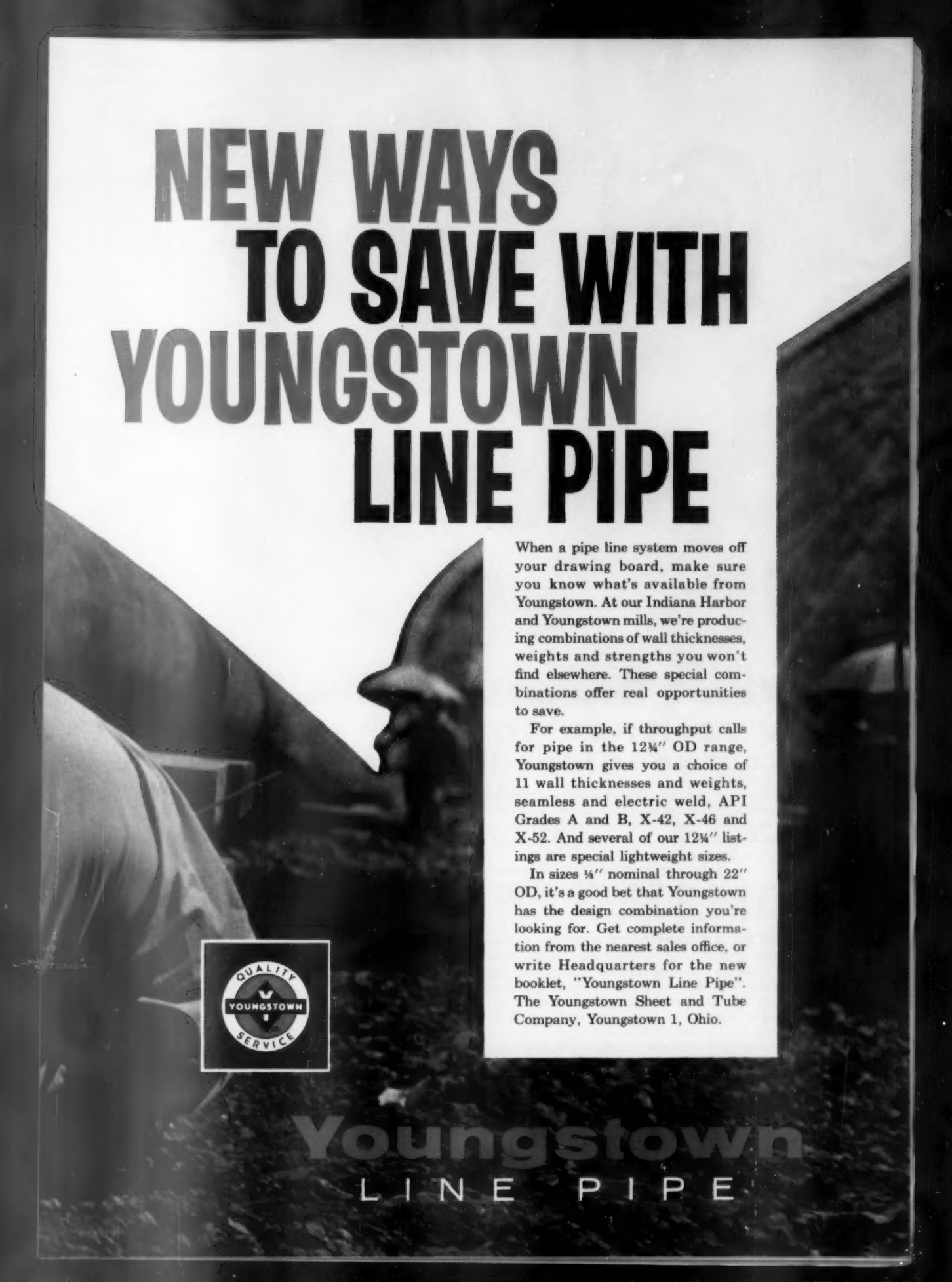
NEW WAYS TO SAVE WITH YOUNGSTOWN LINE PIPE



When a pipe line system moves off your drawing board, make sure you know what's available from Youngstown. At our Indiana Harbor and Youngstown mills, we're producing combinations of wall thicknesses, weights and strengths you won't find elsewhere. These special combinations offer real opportunities to save.

For example, if throughput calls for pipe in the 12¾" OD range, Youngstown gives you a choice of 11 wall thicknesses and weights, seamless and electric weld, API Grades A and B, X-42, X-46 and X-52. And several of our 12¾" listings are special lightweight sizes.

In sizes ⅛" nominal through 22" OD, it's a good bet that Youngstown has the design combination you're looking for. Get complete information from the nearest sales office, or write Headquarters for the new booklet, "Youngstown Line Pipe". The Youngstown Sheet and Tube Company, Youngstown 1, Ohio.

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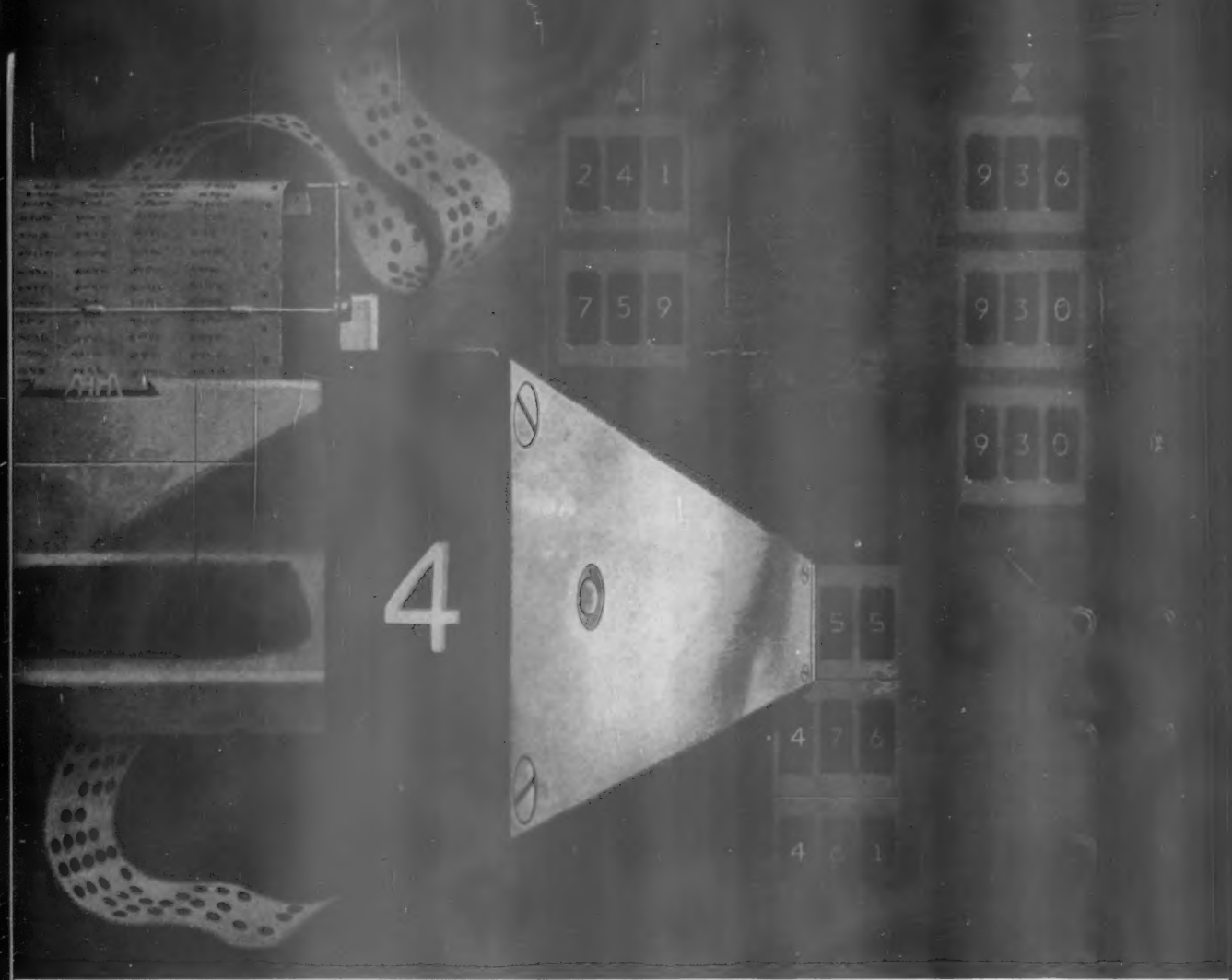
LINE PIPE



NEW CONTROL CONCEPT
can cut your pipeline costs

Did you ever try to solve a jigsaw puzzle without first looking at the total picture the puzzle makes? Pretty difficult—maybe even impossible. Best way, easiest way is to look at the big picture first, then see where the individual pieces fit.

It's the same with pipeline control.

First, look at your total system problem. Then, determine what sort of control system is required to safely, reliably and economically meet tomorrow's need as well as today's. That is Union Switch & Signal's approach to pipeline control.

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Error-free. Whatever the job assigned to it, Union Centralized Control operates completely free from error because it reduces to coded digital form all information and instructions transmitted to or from your central control office. As a result, you can transmit far more precise data than ever before; you can use the least expensive available communications service; and you never need to worry about lightning, noise or other interference causing a wrong or dangerous operation—this coded system automatically checks itself and responds *only* to correct and logical signals. It helps make your pipeline safer. It provides error-free *security* as well as reliability.

Lower operating cost. Most important, Union Centralized Transport Control cuts your operating costs, cuts the cost of future expansion, sometimes even cuts present installation cost of pumping stations.

Write for Bulletins PD 2006, PD 2007 and 1052

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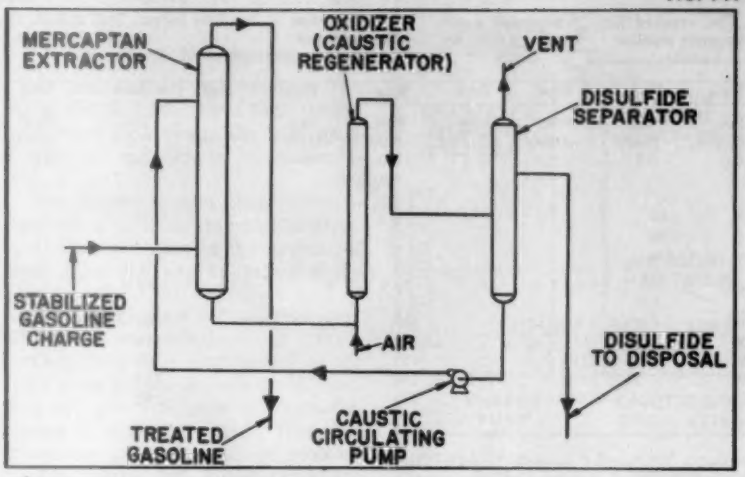
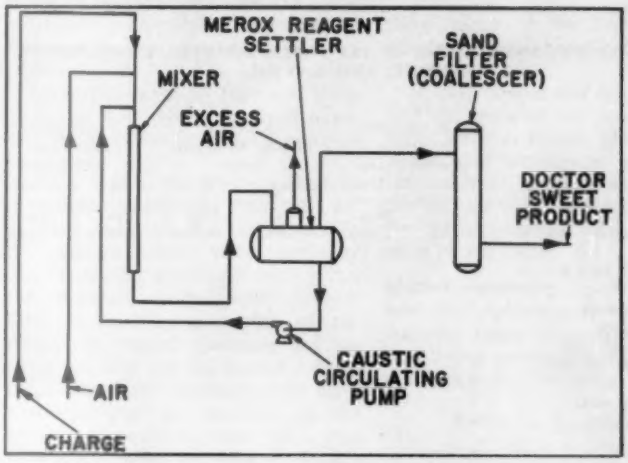
FIG. 1-A



These new extraction . . .

FIG. 1-B



and sweetening processes illustrate a . . .

Low-cost way to treat high-mercaptan gasoline

BY K. M. BROWN, W. K. T. GLEIM, AND P. URBAN
Universal Oil Products Co.

THERE HAS long been a need for an expensive method of treating gasolines of the type that are not quite sour enough to economically justify the cost of a Unisol mercaptan-extraction unit, but which cannot be sufficiently reduced in mercaptan by simple regenerative caustic washing to yield a doctor-sweet product. Also, there is a need for an inexpensive means of treating jet fuels, kerosines, and other middle distillates.

The new UOP Merox process fills this need, and further it avoids the inherent disadvantages of conventional copper sweetening, or doctor (Plumbite) sweetening. The Merox process performs the dual function of extracting easily removed mercaptans and converting the remaining mercaptans to disulfides, thereby yielding a doctor sweet product.

The Merox process is a combination of mercaptan extraction (Fig. 1-A) and sweetening (Fig. 1-B). Either of these functions can be carried out independently when desired. The process can operate as a mercaptan extractor only and is referred to herein as Merox extraction. When operated to sweeten only, that is, to convert mercaptans to disulfides, it is referred to as Merox sweetening.

The combination operation is applicable to all gasoline and lighter-boiling-range materials, and the sweetening step is applicable to many jet fuels and kerosines. The process was developed in the research laboratories of Universal Oil Products Co. and is available under license to the refining industry.

The Merox process accomplishes its dual function by using a catalyst. This catalyst has a high degree of activity in promoting direct oxidation of mercaptans to disulfides at ambient temperatures using atmospheric oxygen according to the following over-all reaction:

$$RSH + \tfrac{1}{4}\,O_2 \rightarrow \tfrac{1}{2}\,RSSR + \tfrac{1}{2}\,H_2O \qquad (1)$$

Mercaptan Extraction

In the extraction application, the mercaptans are extracted by caustic soda, forming a weak chemical combination with the sodium hydroxide as follows:

$$\underset{\text{(oil)}}{RSH} + NaOH \rightleftarrows \underset{\text{(aqueous)}}{NaSR} + H_2O \qquad (2)$$

Reaction 2 is reversible and, therefore, it is not possible to get complete mercaptan removal by extraction alone without use of an excessive amount of caustic soda solution. The principles of mercaptan extraction have been thoroughly covered in the literature.[5 12 19] In general, the conditions favoring the forward reaction are:

1. Low temperature.
2. Low molecular weight of the mercaptan being extracted.
3. High caustic concentration.

The forward reaction is also favored by the use of compounds which increase the solubility of mercaptan ions in the aqueous phase.[20] Of these, methanol as used in the Unisol process[2 4 7 11 13 20] is by far the most effective. Others (that have been used commercially) are isobutyric acid and petroleum cresols.[5 20 21] As with other mercaptan-extraction processes, these solubilizing agents are effective in Merox extraction.

Regeneration . . . In conventional mercaptan extraction the caustic is regenerated by stripping with steam at the boiling point of the caustic solution. The high temperature favors the reversal of Reaction 2, the steam vaporizing the mercaptan released by this reversal and removing it from the reaction site.

In the Merox process the caustic is regenerated, after separating it from the hydrocarbons by blowing it with a small quantity of air at ambient temperature. The regeneration reaction proceeds as follows:

TABLE 1—MEROX SWEETENING OF CRACKED AND STRAIGHTRUN GASOLINES

Sample and Crude Source	Cat. cracked Wyoming pipeline crude		Visbreaker gaso. Wyoming pipeline crude		Lt. S.R. gasoline Mid-Continent crude			T. C. & S. R. Rocky Mountain crude	
	Raw	Trtd.	Raw	Trtd.	Raw	Trtd.	Trtd.	Raw	Trtd.
Doctor Test	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	..	Pos.	Neg.
Mercaptan sulfur, Wt. %	0.0144	0.0002	0.0644	<0.0002	0.0025	<0.0002	<0.0002	0.026	0.0003
Hydrogen sulfide, Wt. %	0.0	0.0	0.0	0.0	0.0	0.0	..	0.0	0.0
Total sulfur, Wt. %	..	..	..	..	0.014	..	..	..	..
Induction period (UOP Bomb) Min.	85	50						965*	
+ 0.002% UOP No. 5 inhib.	..	190						..	..
+ 0.004% UOP No. 5 inhib.	..	300						..	
API gravity	60.6		68.3		75.9			65.6	
Distillation									
I.b.p. °F.	110		88		105			89	
10%	138		131		124			118	
50%	204		210		159			198	
90%	293		275		200			334	
e.p.	332		308		238			390	
Sweetening Cond.		104		104		104	75	..	104
Temp. °F.		100		100		100	100	..	100
Pressure, psig.		dissolved		solid		solid	solid	..	solid
Catalyst type									

*As received sample contained caustic-extractable inhibitor.

$$NaSR + \tfrac{1}{4}\,O_2 + \tfrac{1}{2}\,H_2O \rightarrow \tfrac{1}{2}\,RSSR + NaOH \qquad (3)$$

The disulfides formed in this reaction are insoluble in the caustic solution and can be removed in a gravity separator.

After separation of the disulfides, the caustic is suitable for reuse. Regeneration is not simply the reversal of the extraction reaction; therefore, high temperature and expensive stripping steam are not needed.

The Merox catalyst may be in solution in the caustic or it may be held on a suitable support when greater activity is needed. If it is in solution, the caustic is regenerated by bringing it into intimate contact with air in a suitable reactor which may be an orifice column, a mechanically stirred reactor, or other gas-liquid contactor. If the catalyst is supported on a carrier, the caustic is regenerated by passing it together with air over a packed bed.

TABLE 2—MEROX SWEETENING OF JET FUELS, JET FUEL COMPONENTS, KEROSINE, AND GAS OIL

Sample and Source—	JP-4 (S.R. naphtha) Wyoming pipeline crude		Kerosine Rocky Mountain crude		Virgin gas oil Gulf Coast sour crude	
	Raw	Trtd.	Raw	Trtd.	Raw	Trtd.
Doctor test	Pos.	Neg.	Pos.	Neg.	Pos.	Pos.
Mercaptan sulfur, Wt. %	0.0220	0.0003	0.0068	0.0003	0.0404	0.008
Color	25	14	29	19	....	....
Color after 20 hrs. @ 212° F.	23	14	19	19	....	....
Water tolerance test	1	1	....	....	....	....
Thermal stability (CFR coker test)						
ΔP rise after 300 min., in Hg.	0.1	1.7	....	....	....	....
Tube rating, max.	1	1	....	....	....	....
API gravity	54.8		42.1		37.1	
Distillation						
I.b.p., °F.	139		372		424	
10%	184		398		444	
50%	307		436		486	
90%	398		475		575	
e.p.	432		500		615	
Sweetening conditions						
Temp., ° F.	....	104	....	104	....	117
Pressure, psig.	....	100	....	100	....	100
Catalyst type	....	Solid	....	Solid	....	Solid

Mercaptan Sweetening

Sweetening is defined as converting mercaptans to disulfides, with the disulfides remaining in the oil. There is no change in sulfur content of the oil during sweetening. To carry out Merox sweetening, air is introduced to a caustic-hydrocarbon mixture. The disulfides formed, as an Equation 3, dissolve in the oil being treated.

Again, the catalyst may be in solution in the caustic or it may be held on a suitable carrier when higher activity is needed. When it is in solution, the caustic, hydrocarbon, and air are intimately mixed in an orifice-plate column, or in a stirred reactor or other liquid-liquid contacting device. When held on a support, the caustic, gasoline, and air are passed over a packed bed of catalyst.

Combination operation . . . Both of these functions can be carried out by a combination of the operations shown in Figs. 1-A and 1-B. In Fig. 1-A, the Merox catalyst is dissolved in the caustic soda solution. Oxygen-free gasoline is fed to the bottom of a vertical extractor and flows upward countercurrent to the downward flow of caustic which contains the Merox catalyst. Those mercaptans that are easy to extract will be removed by the caustic in the extraction zone.

The rich caustic from the bottom of the extractor is mixed with air in the oxidizer. Disulfides formed in the oxidizer and excess air are separated from the caustic in the disulfide separator. Regenerated caustic from the disulfide separator is recirculated to the top of the extractor. Disulfides are withdrawn from the separator to disposal, and the excess air is vented.

In some applications sufficient mercaptan removal can be accomplished by extraction alone without use of the sweetening feature.

Catalyst life, without measurable decline of activity, was in excess of 20,000 bbl. per pound of catalyst, in the pilot-plant development of the process using dissolved catalyst. Catalyst life for commercial units using the dissolved catalyst has exceeded this figure. Based on the above life,

the cost of catalyst will be less than 0.1 cent per barrel treated.

Pilot-Plant Investigations

A great variety of gasolines, jet fuels, and kerosines have been treated in a small pilot plant. The pilot-plant equipment was simple, as shown in Fig. 2.

The laboratory-pilot plant investigation of a gasoline sample involves:

1. Determination of the amount of mercaptan that can be extracted by caustic soda.
2. Determination of suitable conditions for sweetening.

Only Step 2 is investigated in the pilot plant proper because the theoretical and practical basis of extraction design is well established. However, laboratory extraction of the mercaptans is carried out to determine the extent to which mercaptans can be removed by extraction, and the tetraethyl lead susceptibility improvement that results from extraction of mercaptans.[6 15 16]

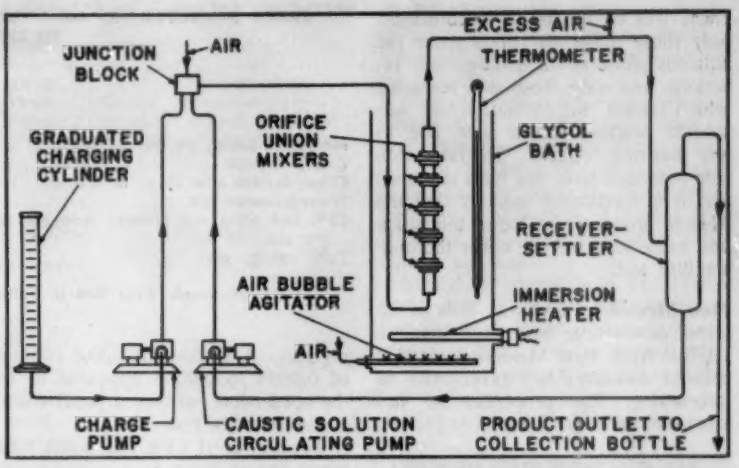
Investigations of jet fuels and kerosines did not involve mercaptan extraction; only the sweetening step was employed.

Table 1 gives the pilot-plant results of gasoline treatment. Pilot-plant experience indicates that all stocks in the gasoline boiling range or lower can be readily sweetened with either the dissolved or the solid catalyst. Data on stability properties of the pilot-plant treated gasolines are incomplete, and are not included herein. Commercial experience has demonstrated that the stability of the gasoline is equal or better than that obtained by other methods of treating.

Higher-boiling stocks . . . These are more difficult to sweeten and may require the use of the more-active solid catalyst. Table 2 gives the before-and-after properties of a jet fuel and a kerosine sweetened in the pilot plant, and one gas oil which is being commercial-treated. The high boiling gas oil shows considerable mercaptan removal although not to the level of negative doctor test.

Of particular interest in the case of the jet fuels is whether or not the process has any harmful effect on the CFR fuel coker test[14] and water-tolerance test.[18] As reported in Table 2, there appears to be no harmful effect.

Copper and doctor (sodium plumbite) sweetening often have a seriously detrimental effect on the coker test and also on the water-tolerance test. Doctor treating often results in failure to pass the copper-strip corrosion test. From a consideration of the mechanism through which the Merox process sweetens as compared to the mechanism of doctor or copper sweetening, there seems to be little fear that Merox sweetening can harm the properties of jet fuel.



PILOT-PLANT Merox sweetener equipment is simple. Pilot-plant experience indicates that all stocks in the gasoline boiling range or lower can be readily sweetened with either the dissolved or the solid catalyst. Fig. 2.

In both copper and doctor sweetening, the reaction to form disulfides takes place in the oil phase. Certain products of incomplete reactions, and side reactions, are consequently left in the oil and their presence may affect the thermal stability and water tolerance of the fuel.

Doctor sweetening . . . Without going into the elaborate detail of a very complex series of reactions,[10] doctor sweetening proceeds—in general—according to the following reactions:

$$2\,RSH + Na_2PbO_2 \rightarrow Pb(SR)_2 + 2NaOH \quad (4)$$

$$2\,Pb(SR)_2 + xS \rightarrow RSSR + RSxR + 2PbS \quad (5)$$

$$Pb(SR)_2 + \tfrac{1}{2}\,O_2 \rightarrow RSSR + PbO \quad (6)$$

The lead mercaptide formed (Equation 4) is oil-soluble. The sulfur added (Equation 5) is oil-soluble. The use of excess sulfur over the stoichiometric requirement is a necessity, to get complete disappearance of oil-soluble lead mercaptide. A very delicate control of excess sulfur is needed. Too much sulfur will cause excessive formation of polysulfides as in Equation 5. Also, it will give a product that is corrosive by the copper-strip test.

In the case of jet fuel the control of sulfur addition is much more critical than has been the case in treatment of ordinary gasolines and kerosines because of the more-severe corrosion test (2 hours at 212° F.) specified,[1] and the fact that polysulfides, which result from excess sulfur, may cause failure in the coker test.

If insufficient sulfur is added, lead mercaptide remains in the oil and when this subsequently oxidizes in the storage tank, very finely divided particles of lead oxide will form (Equation 6). This fine suspension of solids tends to stabilize emulsions and causes failure to pass the water-tolerance test.

Copper sweetening . . . This is generally considered to proceed according to the following reactions:[9]

$$4\,RSH + 2\,CuCl_2 \rightarrow 2\,Cu(SR) + 4\,HCl + RSSR \quad (7)$$

$$RSH + CuCl \rightarrow CuSR + HCl \quad (8)$$

$$2\,CuSR + 2\,CuCl_2 \rightarrow RSSR + 4\,CuCl \quad (9)$$

$$2\,CuSR + O_2 \rightarrow 2\,CuO + RSSR \quad (10)$$

In copper treating it is a practical impossibility to prevent some oil-soluble cuprous mercaptide from remaining in the treated oil. Further, copper chloride reacts with naphthenic acids, phenols, and other oil-soluble polar compounds to form oil-soluble copper compounds.[9]

The presence of oil-soluble copper compounds has been clearly demonstrated in the UOP laboratories as being responsible for the failure of jet fuel to pass the CFR fuel coker test. When oil-soluble cuprous mercaptide is left in the oil due to incomplete reaction (Equations 7 and 8), it will subsequently oxidize (Equation 10) to give very finely divided copper oxide which, as in the analagous case of lead oxide, can stabilize emulsions and cause failure to pass the water-tolerance test.

By contrast, the Merox catalyst is insoluble in the oil, and only those mercaptans which enter the aqueous

phase will be oxidized. Accordingly, only those materials which enter the aqueous phase could undergo side reactions, and only those side reactions which result in formation of oil-soluble products could give rise to any harmful effects. So far, such side reactions have not been observed and it is considered unlikely that the Merox process can harm the stock and cause it to fail the coker thermal-stability test.

New Mexico jet fuel . . . It is of interest to consider in greater detail a jet fuel from New Mexico crude that offered considerable resistance to sweetening. The properties of this stock are given in Table 3.

TABLE 3—PROPERTIES OF NEW MEXICO JET FUEL

API gravity	49.6
Distillation	
I.b.p., ° F.	153
10%	230
50%	332
90%	425
e.p.	460
Hydrogen sulfide, Wt. %	Nil
Mercaptan sulfur, Wt. %	0.0524
Total sulfur, Wt. %	0.149
Color, saybolt	21
Color after 16 hrs. @ 212° F.	<−16
Peroxide number	1.7

The stock was treated at 75° F. and atmospheric pressure through a bed of solid catalyst and the results are shown in Table 4. These results warranted the preparation of sufficient treated products for thermal-stability evaluation using the CFR fuel coker test.[14]

TABLE 4—EFFECT OF CHARGE RATE IN MEROX TREATMENT OF NEW MEXICO JET FUEL ON SOLID CATALYST

Hours on stream	Relative charge rate	Per cent mercaptan sulfur	Doctor test
8	4	0.0013	Positive
24	4	0.0018	Positive
32	1	0.0004	Negative
44	1	0.00018	Negative
49	1	0.00018	Negative
8	2	0.00052	Borderline
16	2	0.00044	Borderline
31	3	0.00080	Positive
39	3	0.00084	Positive
51	3	0.00080	Positive
62	3	0.00080	Positive
80	3	0.00087	Positive
86	3	0.00087	Positive
11	3	0.00088	Positive
17	3	0.00084	Positive
40	3	0.00090	Positive
65	3	0.00087	Positive
87	3	0.00090	Positive

The mercaptans were reduced sufficiently to meet the specification of 0.001% mercaptan sulfur at a treating rate three times greater than the rate needed to make a doctor-sweet product. A mercaptan sulfur content of 0.0004 to 0.0005 appeared to be the border-line between a positive and negative doctor test.

The results of CFR fuel coker tests are shown in Table 5.

TABLE 5—PROPERTIES OF MEROX-TREATED JET FUEL FROM NEW MEXICO CRUDE

	As received	Laboratory copper sweetened	Pilot plant Merox treated
Mercaptan sulfur, per cent	*0.0524	Sweet	Sweet
Color, Saybolt	21	3	12
Color, Saybolt after 20 hr. at 212° F.	Below —16	Below —16	Below —15
Water-tolerance test	1	1	1
CFR fuel coker test pressure drop rise after 300 min., in Hg.	0.2	0.7	0.8
Tube rating, max.	1	1	1

*Different sample from that in Table 3.

This table also shows the coker test results on the same sample after laboratory copper sweetening. Laboratory copper sweetening was carried out under very carefully controlled conditions so as to minimize the amount of copper present in the jet fuel. This same jet fuel in commercial copper-sweetening operation had consistently failed to pass the coker test until substantial additions were made to the plant to remove copper from the treated stock.

The color and color stability of this jet fuel as received, after copper treating and after Merox treating is also given in Table 5. It is obvious that the stock is highly color-unstable. With such a stock it is not unexpected that contacting with air and an oxidation catalyst causes serious color loss.

The loss of color and color stability in copper treating even under carefully controlled laboratory conditions is considerably greater than for the Merox-treated stock, which in the 20-hour exposure test, still remains within the Saybolt color scale.

Commercial Applications

An advantage of the process is the low cost of converting existing treating equipment for use in the Merox process. Results of laboratory treating a gas oil are given in Table 2. This particular gas oil is being commercially treated. Treatment of this gas oil is considered to be a special case.

In this particular case the refiner was interested in removing only 25% of the mercaptans present. He had been using hypochlorite sweetening to accomplish this degree of removal. Hypochlorite was not entirely satisfactory and the chemical costs were quite high. Merox treating in a plant hastily improvised from existing equipment was able to convert 25% of the mercaptans at a considerably lower cost than hypochlorite sweetening.

Unlike copper or doctor treating, Merox can effect a partial reduction of mercaptan without leaving harmful products of incomplete reaction, (oil-soluble mercaptides) in solution in the oil. A comparison of hypochlorite and Merox operating costs for this stock is given in Table 6.

TABLE 6—CHEMICAL COST OF MEROX TREATMENT

(To convert 25% of the mercaptans in a sour Gulf Coast No. 2 distillate containing 0.04% mercaptan sulfur)

Treating rate, bbl. per day	2,600
Chemicals:	
Initial charge:	
Caustic soda, 261 lb.	$7.83
Merox catalyst, 0.42 lb.	5.25
Added during 21 operating days:*	
Caustic soda, none	
Merox catalyst, 0.58 lb.	7.25
Total chemicals for treatment of 54,600 bbl.	$20.33
Chemical cost, cents per bbl.	0.037

$$\text{Catalyst life to date} \frac{54{,}600}{1.0} = 54{,}600 \text{ bbl. per lb.}$$

*Merox solution was still useful.

To sweeten the same amount of stock with sodium hypochlorite would have consumed 174,000 gal. of hypochlorite solution made up of:

Caustic soda	29,300 lb. at 3c/lb. =	$879.00
Chlorine	7,280 lb. at 3c/lb. =	218.00
Water	1,420,000 lb.	
Total		$1,097.00
Chemical cost, cents per bbl.		2.01

A commercial Merox extractor and sweetener is currently in successful operation using a converted conventional steam-regenerated caustic scrubber and copper-sweetening unit. Fig. 3 shows the flow in this converted plant.

The only addition to the existing plant was a disulfide separator, also an existing vessel. The other simple changes were in piping to introduce air into the regenerator through the existing steam inlet, and into the bot-

TABLE 7—COMPARISON OF COMMERCIAL RESULTS OF GASOLINE TREATING

	Raw gasoline	Former operation: Mercaptan extract. (steam regen.)	Former operation: Copper sweet.	Merox process: Mercaptan extract.	Merox process: Sweet.
Gasoline charged, bbl. per day	525				
Mercaptan content, % S:					
Raw gasoline	0.06				
After mercaptan extr.		0.017-0.024		0.011-0.017	
After sweetener			Swt.		Swt.
Regenerated caustic		0.25-0.35		0.02	
Operating-cost comparison:					
Power: same both cases—					
Caustic consumption, cents/bbl.		Equal	None	Equal	0.12
Catalyst, cents/bbl.			2.58	*0.05	†0.06
Air, cents/bbl.			0.05	‡0.022	
Steam, cents/bbl.		3.6			
Operating labor		Equal	Equal	Equal	Equal
Maintenance labor (changing catalyst)			1.50		
Total		3.6	4.13	0.072	0.18
Combined cost—both operations		7.73		0.252	
Savings to refinery by Merox, cents/bbl. (exclusive of royalty)		7.48			

*Initial catalyst charge—no makeup required to time of study. †Initial charge plus weekly makeup of 25 to 50 g. ‡Use of existing equipment (oversized for the new service) resulted in poor contact efficiency; therefore, air used was greatly in excess of theoretical requirement.

tom of the water washer through the drain line. The water-wash vessel was converted to serve as the Merox sweetener.

The results of Merox extraction and sweetening in this commercial unit have exceeded results obtained when using steam stripping and copper sweetening from the very beginning of the operation as shown in Table 7. Table 8 gives the properties of the treated gasoline.

TABLE 8—MEROX TREATMENT OF THERMALLY CRACKED GASOLINE

	Charging stock	Merox-extracted and sweetened
Doctor test	Positive	Negative
Peroxide No., Yule & Wilson	1.31	1.07
Hydrogen sulfide	<0.0002	<0.0002
Mercaptan sulfur	0.0386	0.0002
Copper, mg./l.	0.01	*0.42
Color	−10	+5
ASTM gum, mg./100 ml.	4.6	1.5
Induction period, min.:		
Without inhibitor	165	65
+0.01% UOP No. 4 inhibitor; +0.001% UOP copper deactivator	330	265
API gravity	60.9	61.4
Distillation:		
I.b.p., °F.	87	85
5% Overhead	112	108
10%	127	124
50%	242	242
70%	290	290
90%	349	349
E.p.	392	391
% Recovered	97.0	97.0
% Bottoms	1.0	1.0
% Loss	2.0	2.0

*The copper in the treated stock is due to pickup from incomplete cleaning of the converted copper-treating plant.

A commercial plant is in operation using solid Merox catalyst to treat thermally cracked gasoline. This plant was converted from a steam-stripped caustic mercaptan extractor plus a copper-sweetening plant to Merox extraction plus Merox sweetening. The operation has been successful from the outset. Table 9 compares some properties of the gasoline obtained from the old and new operation.

Reliable operating-cost data are not yet available for this solid-catalyst unit. It is expected that Merox catalyst cost will be less than 0.25 cents per barrel, but it will be several months before catalyst-life figures are available. Other operating costs are much lower than in the previous operation through elimination of about 45 lb. of stripping steam per barrel of gasoline, and a cost of about 2 cents per barrel for copper sweetening reagent.

In another plant a pentane cut containing 0.04% mercaptan sulfur is being sweetened in an operation which involves bubbling the pentane, containing slightly more than the stoichiometric air requirement, through a pool of caustic soda containing Merox catalyst in solution.

Before the decision to use Merox sweetening, $120,000 had been appropriated to build a steam-regenerated caustic scrubber to extract 90% of the mercaptans from this pentane cut. Catalyst life in sweetening the pentane exceeds 20,000 bbl. per pound.

The same type of operation as used for treatment of the pentane is also being carried out in another refinery on a blend of light straightrun gasoline and catalytically cracked gasoline containing 0.001% mercaptan sulfur. This stock could not be consistently inhibitor-sweetened probably because of limitations in ability to hold temperatures above 80° F. in the storage tank.[21]

Although it could have been easily and inexpensively sweetened by almost any process, Merox was the only one which could be put into use with no modifications to existing equipment except a means of injecting air and a few grams of catalyst per week.

Summary

The Merox process should find widespread use in treatment of the following classes of products:

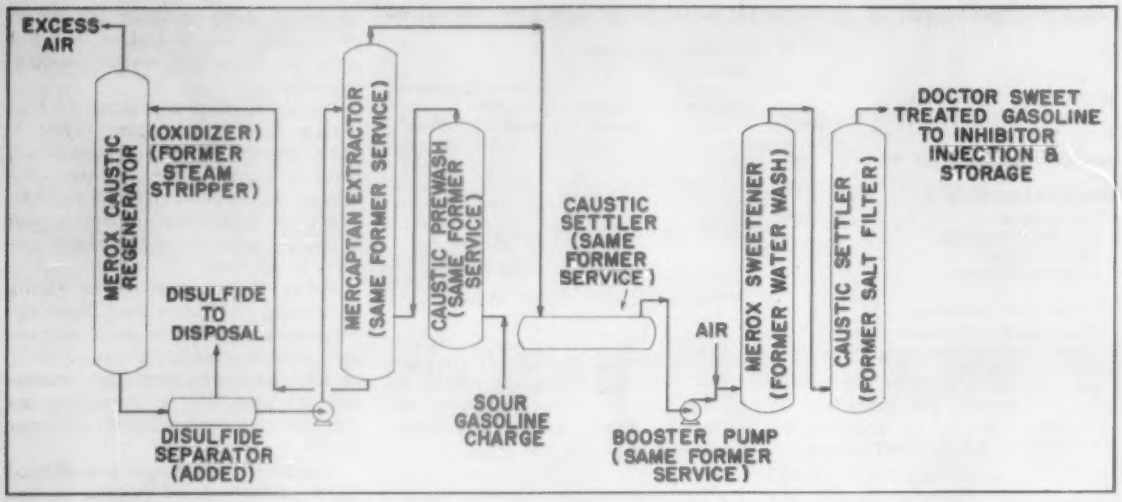
1. Sour propane or butane streams fed to poly plants or to alkylation units. In this application, extraction would be used for complete removal of mercaptan with Merox regeneration of the caustic. This method of removing mercaptan—eliminating of the large amount of steam needed for caustic regeneration by conventional steam stripping—is very economical.

The air required for Merox regen-

TABLE 9—COMPARISON OF COMMERCIAL TREATING RESULTS, THERMALLY CRACKED GASOLINE

	Charge	Former operation: After steam-regen. caustic wash	Former operation: After copper sweet.	Present operation: After Merox-regen. caustic wash	Present operation: After Merox sweet.
Mercaptan sulfur, %:					
Gasoline	0.035	0.0068	Dr. sweet.	0.0026	Dr. swt.
Caustic:					
Rich				0.07	
Regen.				0.002	
Induction period,* min.			360		480-670
ASTM gum,† mg./100 ml.					1-2

*Plant inhibited with 20 lb. UOP No. 5 inhibitor and 1 lb. UOP copper deactivator per 1,000 bbl. †Gum dish not heptane-rinsed as per ASTM D 381-58T.


EXCESS AIR
MEROX CAUSTIC REGENERATOR
(OXIDIZER) (FORMER STEAM STRIPPER)
DISULFIDE TO DISPOSAL
DISULFIDE SEPARATOR (ADDED)
MERCAPTAN EXTRACTOR (SAME FORMER SERVICE)
CAUSTIC PREWASH (SAME FORMER SERVICE)
SOUR GASOLINE CHARGE
CAUSTIC SETTLER (SAME FORMER SERVICE)
AIR
BOOSTER PUMP (SAME FORMER SERVICE)
MEROX SWEETENER (FORMER WATER WASH)
CAUSTIC SETTLER (FORMER SALT FILTER)
DOCTOR SWEET TREATED GASOLINE TO INHIBITOR INJECTION & STORAGE

COMMERCIAL Merox extractor and sweetener is currently in successful operation using a converted conventional steam-regenerated caustic scrubber and copper-sweetening unit. Fig. 3.

eration is substantially the same for all mercaptans regardless of molecular weight; whereas, in steam regeneration a great deal more steam is needed to strip mercaptans of low molecular weight.

2. Sour pentane or hexane streams which may be extracted or sweetened.

3. Light straightrun gasoline boiling below the range of charge stocks to Platforming or other catalytic reforming treatments. To take full advantage of the process, such streams should be extracted and then the residual mercaptans sweetened.

This application of the process fills a long-sought need for an inexpensive process that takes full advantage of tetraethyl lead susceptibility improvement due to sulfur removal without the expense of a Unisol extraction unit or the combination of a steam-regenerated caustic scrubbing unit followed by a sweetening unit.

4. Certain catalytically cracked gasolines which resist the usual inhibitor-sweetening treatment.[21] It is more economical, of course, to inhibitor sweeten when such can be done within limitations of inhibitor sweetening.

5. Thermally cracked gasolines of low mercaptan content which are not sour enough to justify Unisol treatment, and which cannot be sweetened with UOP No. 5 or 5-S inhibitor. The Merox process can successfully sweeten stocks of high mercaptan content; however, if the mercaptan sulfur exceeds about 0.1% it may be more economical to install a Unisol unit for complete mercaptan removal so as to take full advantage of tetraethyl lead savings due to increased lead susceptibility.

6. Most jet fuels can be sweetened very economically or, if preferred, reduced sufficiently to meet the specification of 0.001% mercaptan sulfur. Either catalyst dissolved in caustic solution or solid catalyst may be used. It is anticipated that solid catalyst will be more generally used depending on catalyst-life experience.

7. When only partial sweetening is adequate, the Merox process may also be applied to higher boiling stocks in the No. 2 fuel-oil range. Usually such stocks need not be doctor sweet and are seldom treated except for improving their stability toward sediment formation and color degradation. There may be, however, an occasional stock which must be sweet or at least have a part of the lower-boiling mercaptans removed. The Merox process is applicable to treatment of such stocks, as in the commercial example cited.

The Merox process, both sweetening and extraction, is carried out at room temperature or slightly above. There is no corrosion problem as caustic soda is not corrosive to mild steel and cast iron under these conditions.

Electric power for pumping, a small amount of exhaust steam and about 0.5 to 2 standard cu. ft. of air per barrel treated, depending on the mercaptan content, are the only utilities used. These items do not significantly affect operating costs.

The only chemical consumed is caustic soda. Its consumption is not a function of the Merox process but of the hydrogen sulfide and non-mercaptan organic acids present.

Catalyst costs will be in the class of 0.05 to 0.1 cent per barrel for the soluble catalyst. When solid catalyst is used, it is expected to be considerably less costly than copper-sweetening reagent, but commercial units have not been in existence long enough to develop reliable life data.

Operating labor will be less than 8 man-hours per day for most units.

The Merox process holds promise of bringing about considerable simplification and savings in refinery treating operations for a great variety of stocks.

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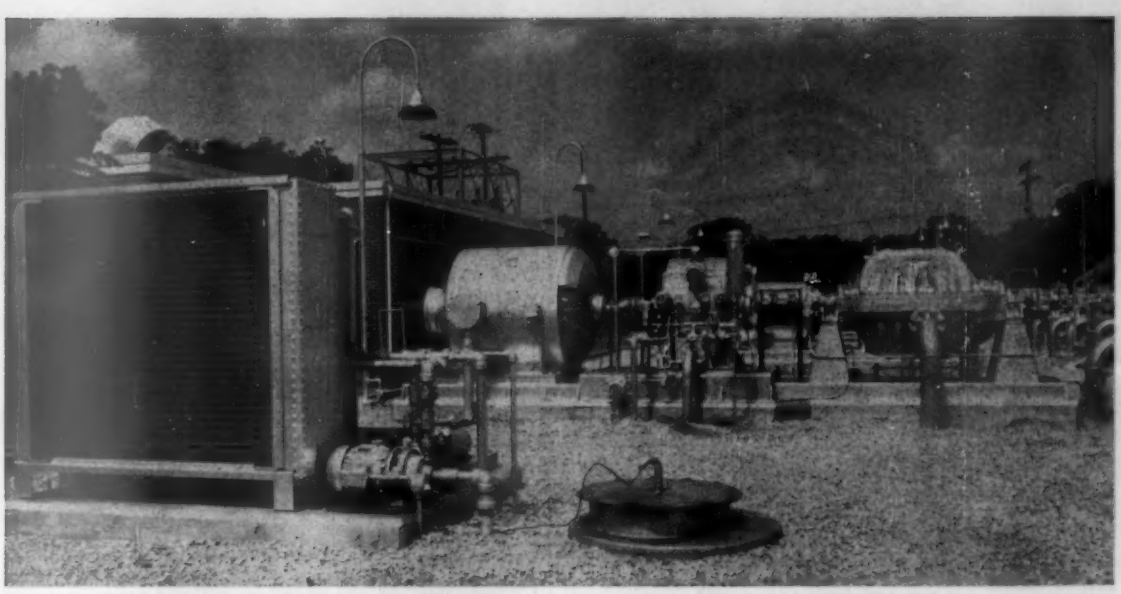


Eddy-current drive transmits rotation from constant-speed motor to centrifugal pump. This type of . . .

Variable-speed drive cuts power costs

DURING the past year of operation, the following advantages have been realized by using eddy-current variable-speed drives on the Cherokee system:

- **Power savings will pay out the additional investment cost over throttling valves in less than 3.5 years.**
- **Electric-demand controllers used in conjunction with the drives will permit a more complete range of operations and result in increased capacities for given power settings.**
- **Smooths out the line operating conditions and effectively reduces the maintenance of pump and motor equipment.**

BY E. C. MICHELS
Chief Engineer
Continental Pipe Line Co.

THE head-capacity characteristics of a constant-speed electric-driven centrifugal pump can be designed to meet a limited number of operating conditions on any given petroleum pipeline handling multiple products.

The various and continually changing operating conditions depend upon the throughput needs and the physical characteristics of each product. It is therefore necessary to provide a method of control so that, within a preset range of suction and discharge pressures and power-consumption limits, a maximum number of operating conditions will be met.

The throttle valve is an accepted way to control the pump output. The variable-speed drive, which can also be used for controlling the pump unit, will provide a more flexible operation and reduce the power costs.

The eddy-current principle is used in the variable-speed drives installed on the products division of Cherokee Pipe Line Co.'s system to Wood River, Ill. Single electric-driven pump units were installed on each of the two 10-in. lines at the five booster stations between Glenn Pool, Okla., and Wood River, as shown in Fig. 1. These pump stations, which are remotely controlled from Wood River, have been operating since September 1958.

It can be shown how an eddy-current drive, which lends itself to the operation, will pay out the additional investment cost compared with throttling through power savings; furthermore, by using electric-demand controllers, additional throughput is obtained for any given power setting.

Eddy-Current Drive

The eddy-current drive transmits the rotation from the constant-speed electric motor to the centrifugal pump. The coupling consists basically of three members: The stationary member or field assembly, the driving member or drum, and the driven member or rotor.

The field assembly is composed of a field coil enclosed in a field housing which, together with the end bells, form the stator or housing of the drive unit. The field housings are separated on the inner surface of the field assembly by a metal magnetic barrier to form the north and south polar rings of the field assembly. Since the field assembly is stationary, the excitation current is conducted to the coil directly through the field-coil leads.

The drum or driven member re volves within the field assembly with the outer surface of the drum separated from the polar rings of the field housings by an air gap. The drum is divided into two cylindrical sections by a metal magnetic barrier. Each

GLENN POOL-WOOD RIVER products line of Cherokee Pipe Line has electric variable-speed drives at five remotely controlled pump stations. Fig. 1.

section assumes the polarity of the adjacent polar ring when the field coil is excited.

The rotor with poles similar to the teeth of a spur gear revolves inside the drum. An air gap separates the tips of the rotor poles from the inner surface of the drum.

As current is applied to the field coil, magnetic lines of force flow from the north polar rings of the field and drum sections to the rotor poles and from the rotor poles to the south polar rings of the field section. These lines of force converge at the drum's inner surface as they flow into the rotor poles, causing areas of high flux density as shown in Fig. 2.

As the rotor revolves in relation to the drum, the flux density at any given point on the drum's inner surface varies as that point is passed alternately by the poles and grooves of the rotor. This flux variation generates eddy-currents in the inner surface of the rotor and establishes a magnetic field with polarity opposite to that of the field established by the driving field coil.

Torque is transmitted from the drum to the rotor by a magnetic attraction between the eddy-current field in the drum and the poles of the rotor.

The strength of the eddy-current field varies with the rate of flux variation and with the amplitude and frequency of the variation. Amplitude is determined by the field-coil strength or excitation current, while frequency is a function of the "slip," or difference in the speeds of the drum and rotor.

At a given field strength, with load conditions constant, the slip between the drum and rotor will remain relatively constant at the frequency required to develop an eddy-current field of sufficient intensity to transmit the required torque.

As the excitation current is increased, the slip is reduced, since the amplitude of flux variation is greater and the speed of the rotor will approach the speed of the drum. Speed control of the coupling is obtained with a control system that adjusts the field-coil amperage to deliver the required torque at the desired speed.

A tachometer generator on the driven member of the unit produces a voltage in direct proportion to the speed at which it is driven. This voltage is used in the governing circuit of the electronic control to achieve speed control of the driven member of the coupling.

Electronic Controllers

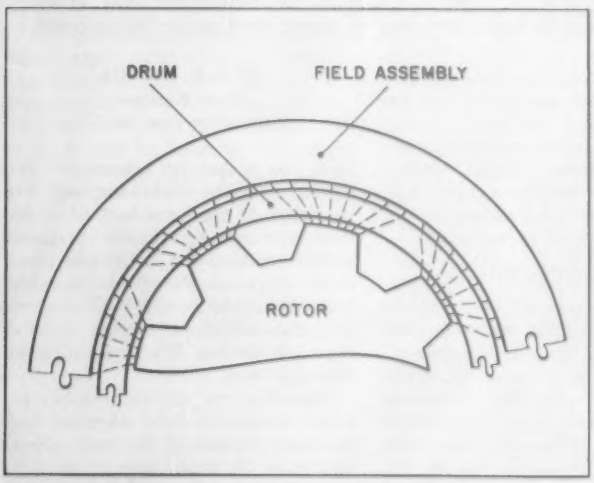
Each pump station on the Cherokee system is equipped with three electronic controllers which feed signals into the governing circuit to regulate the coupling speed or output of the pump. The functions which are controlled are:

1. Low suction pressure.
2. High discharge pressure.
3. Station electric demand.

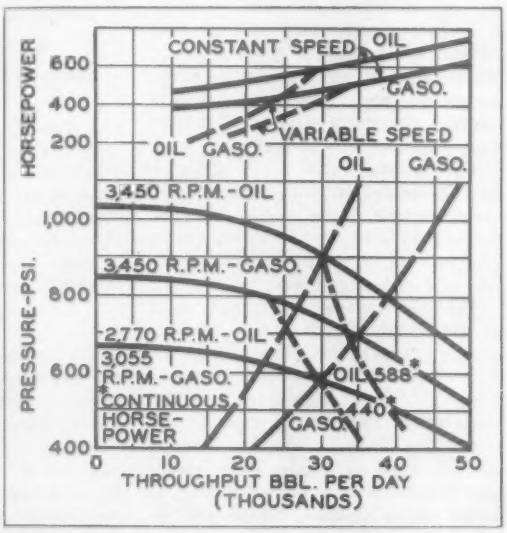
When the preset limits of any one of these functions are exceeded, a signal from the controller to the governing unit will cause the excitation current to be reduced. The unit will thus slow down, therefore reducing the pressure and flow.

Efficiency

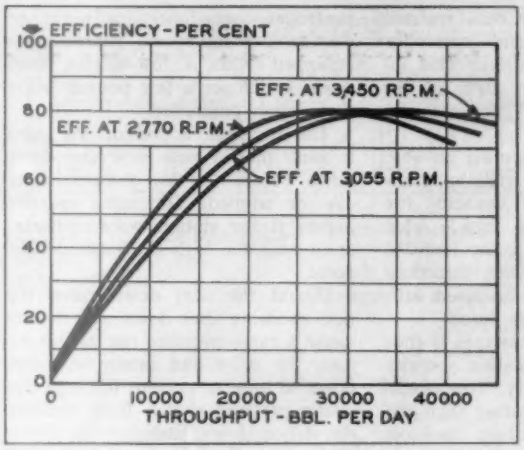
The efficiency of the eddy-current drive is in direct proportion to input



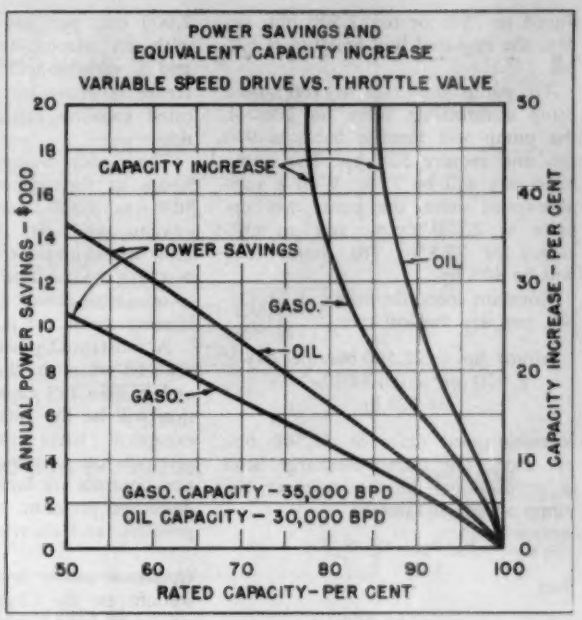
FLUX PATTERN of stationary field coupling shows magnetic lines of force converging at drum inner surface. Fig. 2.



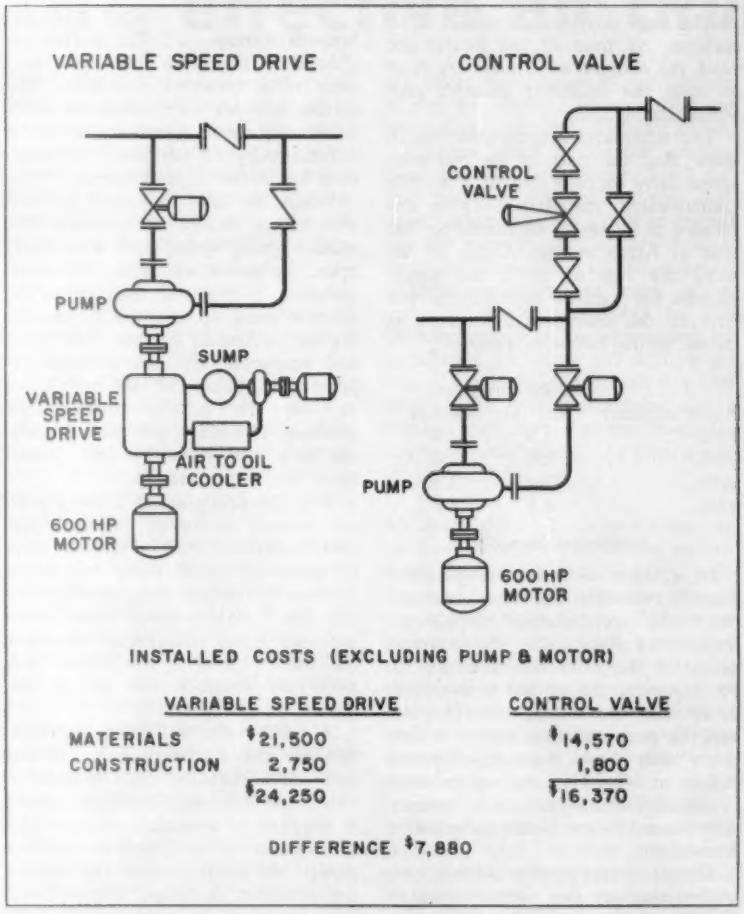
CHARACTERISTICS of pump and pipeline and horsepower curves are shown for Afton, Okla., pumping station. Fig. 3.



PUMP EFFICIENCY curves show advantage of reducing speed over throttling. Fig. 4.



POWER SAVINGS are for throughputs of 50-100% of rated capacity. Fig. 4.



COST of variable-speed drive exceeds throttle control-valve installation by $7,880. Fig. 6.

and output speed. Fixed losses amounting to 2 to 4% also add to the losses due to slip in the drive; therefore at 90% speed, the efficiency of the drive is from 86 to 88%.

At Afton station, one of the units is a 600-hp. explosionproof 3,550-r.p.m. constant-speed motor driving an eddy-current variable-speed drive and centrifugal pump. At full speed and load, the excitation power is 1,100 watts and slip approaches 100 r.p.m.; therefore the fixed losses amount to 1.47 hp. for excitation and 16.9 slip hp., or a total fixed loss of 18.37 hp.

The cooling-oil pump and cooling fan require up to 6 additional hp.; therefore 25 hp. has been assumed as the total fixed losses in these calculations. These losses are approximately equivalent to losses expected across a fully open throttle valve.

Fig. 3 shows the typical pump and line characteristics and horsepower curves for Afton station. The constant speed horsepower curves represent the motor horsepower required to drive the pump throughout its operating ranges for fuel oil and gasoline.

The pump efficiency curves are shown on Fig. 4. It should be noted that, if the pump is operated at a rate less than the maximum peak-efficiency rate, it is more efficient to do so by reducing speed rather than throttling the pressure at full speed.

For example, Afton station is designed to operate at 900 psi., at which pressure the fuel oil rate is 30,000 bbl. per day and requires 588 hp. at full speed with a pump efficiency of 78.5%. If the throughput rate is re-

duced to 75% or to 22,500 bbl. per day, the required line pressure is 625 psi.

To pump this rate at full speed using a throttling valve for control, the pump will throttle back to 970 psi. and require 525 hp. The pump efficiency will be 71%. With a variable-speed drive, the pump will operate at 2,770 r.p.m. and an efficiency of 77.5%. The motor load will be 405 hp.

Constant speed throttling at 22,500-bbl. per day fuel-oil rate:

$$\text{Motor hp.} = 22{,}500 \text{ bbl. per day} \times 970 \text{ psi.} \times 0.000017/71\% = 525 \text{ hp.}$$

Variable-speed drive at 22,500 bbl. per day: (The pump discharge head is proportional to the ratio of the pump speeds squared.)

$$P_2/P_1 = (S_2/S_1)^2$$

thus

$$S_2 = (630/970)^{1/2} \times 3{,}450 \text{ or } 2{,}770 \text{ r.p.m.}$$

$$\text{Drive efficiency} = S_2/S_1 = 2{,}790/3{,}450 \text{ or } 80.5\%$$

$$\text{Motor hp.} = \text{Pump b.hp./drive efficiency} + \text{fixed losses}$$

$$= \frac{22{,}500 \text{ bbl. per day} \times 625 \text{ psi.}}{77.5\% \times 0.000017} \times 80.5\% + 25 \text{ hp.} = 405 \text{ hp.}$$

Power Savings

A power reduction of 120 hp. is realized, therefore, which, at a 1 cent per killowatt-hour rate, will amount to a savings of $7,820 per year.

Let us further assume that a setting of 440 hp. is made on the electric-demand controller and that the station is pumping gasoline. If the station is equipped with a throttle valve, the flow rate would be limited to 23,000 bbl. per day. The station would be throttling from 795 psi. to 435 psi. Using a variable-speed drive, the pump would operate at full speed until the 23,000 bbl. per day rate was reached.

At this point the demand controller will signal for the pump to slow down to stay within the demand limit. As the pump slows down, it will operate along the 440 continuous hp. curve until it reaches the gasoline-line characteristic curve at the 30,000 bbl. per day rate. An increase in capacity of 7,000 bbl. per day is thus realized with an electric-demand controller and a variable-speed drive. This increase is equivalent to 20% of the rated gasoline capacity for the station.

The power savings shown on Fig. 5 are at throughputs ranging from 50% to 100% rated capacity for gasoline and oil. The curves also show the equivalent capacity increase that can be realized when throttling to minimize power as compared with slowing down the pump speed.

A substantial power savings is thus realized whenever the station operates at less than full capacity. This condition will be the rule rather than the exception when handling multiple products on a system and when station controls are limited by maximum discharge pressure, minimum suction pressure, and electric demand.

Optimum power level . . . Since all stations on the Cherokee system are equipped with demand controllers, the power level for the system can be optimized for a given throughput. In practice, the power meters are read on the same day of each month at all stations. As soon as the meters are read, the demand controllers are reset to meet the following month's projected throughput.

The schematic diagrams in Fig. 6 show that the cost of the variable-speed drive exceeds that of a throttle control-valve installation. The difference of $7,880 is estimated for the unit at Afton station. Using an income tax rate of 50%, the power savings for various throughputs will pay out the additional investment as shown in the following table:

Rated capacity	Payout-Years fuel oil	Payout-Years gasoline
60%	1.3	1.8
70%	1.7	2.4
80%	2.4	3.5
90%	4.5	6.8

Additional Benefits

In addition to these savings, other tangible benefits are also realized. Since the speed-control signals are transmitted electrically, the response action of the drive is immediate. If, for instance, the station is operating at or near the suction control point and the next upstream station is suddenly shut down because of power failure or otherwise, the sudden drop in station suction pressure is immediately sensed by the electronic pressure transmitters.

The electronic station suction controller receives the pressure signals simultaneously; and when the pressure reaches the set-point limit, the controller immediately calls for reduction in pump speed. The station is equipped with a low-suction shutdown switch set a few pounds below the suction controller.

The response action of the drive is such that it will slow the pump down before the low-suction switch can be tripped. The same reaction occurs if the station were operating at or near the high discharge control point.

Should the next downstream station suddenly shut down and in turn cause a rapid pressure rise at the station, the drive and pump will slow down in time to prevent the high discharge-pressure switch from shutting the station down; therefore the drives will reduce the effects of and minimize the occurrence of line surges due to a station suddenly shutting down.

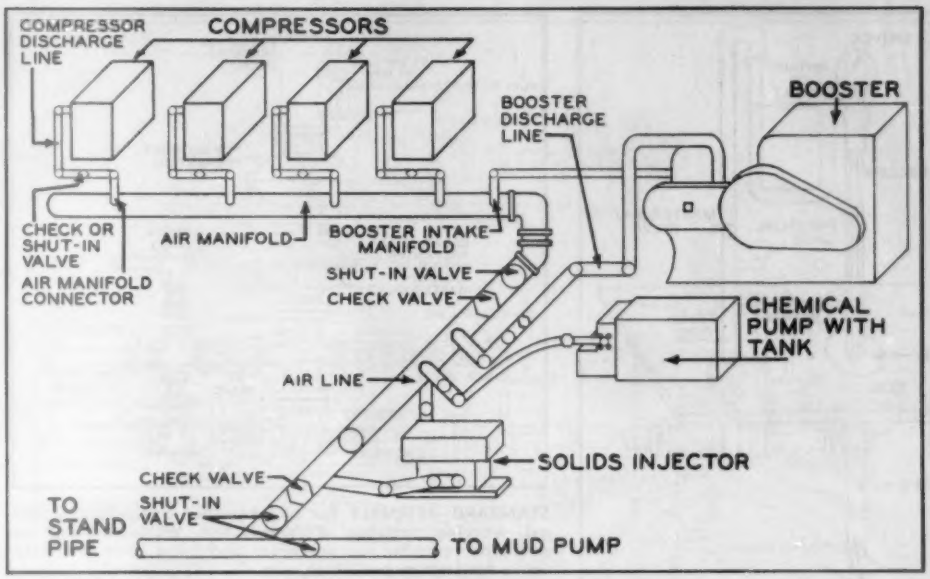
Although the stations will shut down suddenly because of power or equipment failures, these occasions are not too frequent as compared with the number of shutdowns caused automatically to permit passage of scrapers by the stations.

Smooth startup . . . The startup sequence of the drive unit also lends itself to a smoother operation. The station will not start unless the drive is at zero-speed condition, which it automatically adjusts itself to whenever the station is shut down.

When the start sequence is initiated either locally or remotely, the suction valve opens; and when fully open, the motor will start. The speed governor control will then cause the drive to come up to speed by increasing the excitation current. The drive will accelerate, the rate of which is adjustable, until the set values on any of the station controls are reached. The drive will then accelerate at a rate such that the control limits are not exceeded.

It is common practice to use a positive shutoff discharge valve on stations controlled with a throttle valve to minimize motor loads and transmission-line voltage drops during startup. The variable-speed drive starts with the pump disengaged; therefore the starting load is less, which will materially lengthen the life of the motor.

A check valve will adequately suffice for the discharge valve of the unit, thus reducing the number of valve operators and controls normally required at automatic stations; also the shut-in or case pressure of the pump will never exceed the operating pressure. A longer life is therefore expected on pump seals, wear rings, and impellers.



GENERALIZED surface equipment hookup for air drilling under varying hole conditions. Fig. 1.

Here is some of the equipment you'll need for

effective air drilling

BY F. W. SMITH

THE HORSEPOWER needed to air drill a certain hole size at a given penetration rate in a given area under constant hole conditions can be plotted according to depth. Should this curve be used to find horsepower requirements for some other area, the job might well be an economic failure. Maintaining a clean hole is the primary duty of horsepower for air-drilling compressors. The amount of horsepower needed to clean the hole depends on many things.

The first variable is hole size. Hole size varies in a well where a liner is hung. A soft section may erode while being drilled and give hole enlargement. The horsepower needed for hole size must satisfy the most demanding portion of the hole.

A wet hole requires more horsepower than a dry one. Foaming agents have reduced this requirement; however, the additional weight to lift out of the hole requires more energy.

Penetration rate affects the demand. As cuttings are accumulated faster, their total weight increases and more energy is needed to lift them.

Depth is a factor in that friction increases with depth and the total weight of cuttings in the annulus increases.

The cutting size, shape, and density affect the slippage of the cuttings in the air stream. Heavy, spherical cuttings are extremely difficult to lift.

Friction losses in surface connections consume horsepower. Small i.d. drill pipe and drill collars also consume horsepower. Jet bits or restricted bits use energy. A small flow line or restricted flow line uses horsepower.

Those variables and many others make it almost impossible to plot an accurate curve for horsepower requirements for air or gas drilling. At best it would be a wide curve which would only give a minimum and a possible maximum. The maximum for any well would actually be determined by economics.

Air manifolds . . . Air manifolds and air lines should avoid undue restrictions and have a safe working pressure. All low-pressure equipment should be protected by a 1,500-psi. or higher check valve. Each compressor should be protected by a valve or check valve for maintenance and to facilitate changing units. Hammer unions speed installation and prevent damage to air piping when being moved.

Fig. 1 is a recommended layout.

The mud line should have a high-pressure valve between the mud pumps and the air opening to prevent air from getting into the pumps.

The air opening in the mud line should have a high-pressure valve to be closed when the air compressors are down and mud drilling is started. A valve is needed at the compressors to close for connections and otherwise control air flow.

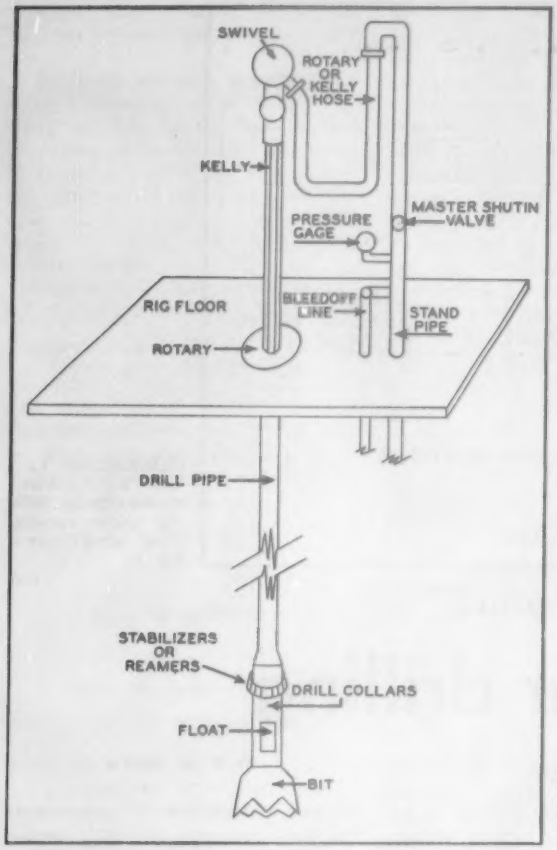
Additional equipment such as boosters, chemical pumps, injectors, etc., should be protected by valves and check valves. In aerated fluid a double check - valve arrangement is necessary to insure free, safe passage of air to protect the equipment from any fluids or pressures from the rig.

Gas manifolds . . . The gas supply line should be sized to deliver sufficient volume for drilling, with consideration for increased demands for special problems. The working pressure should be above the maximum pressure of the source.

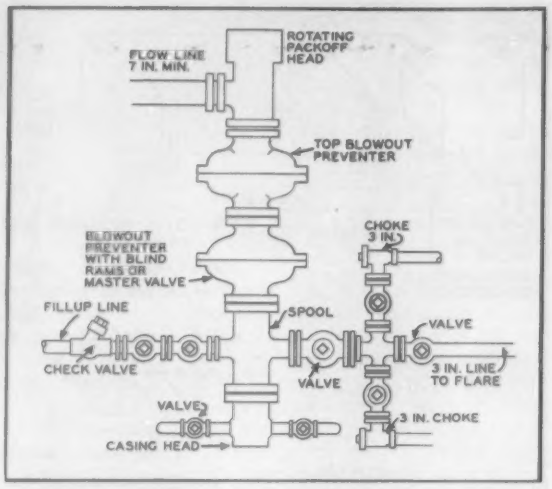
The main control valve should be located 150 ft. from the rig. It should be maintained in perfect working order and everyone on the rig should be familiar with its location and operation in event of emergency. It should be easily accessible.

As Fig. 2 shows, the gas line should tie into the standpipe on the rig floor. The following connections are from the gas supply to the standpipe, all of which should be easily observed and controlled on the floor: A pressure gage for the gas-supply line; a valve to be used for connections and

Author is president, Technical Drilling Services, Midland, Tex. This article is a condensation of a paper presented at 1959 Petroleum Mechanical Conference of ASME, Houston.



RIG and downhole assembly equipment for air or gas drilling. Fig. 2.



STANDARD ASSEMBLY for two blowout preventers, 3,000-psi. working pressure, 6,000-psi. test. When drilling, use drill-pipe rams for top preventer and blind rams or master valve for bottom preventer. Fig. 3.

otherwise control the gas supply; a choke to regulate the volume of gas; a check valve to prohibit any fluids from being pumped up the gas line; a pressure gage for drilling pressure. A flow meter between the check valve and control valve is recommended but not necessary.

Size, weight of compressors . . . Numerous factors regulate the size and weight of compressors to be used in air drilling. The variations in state regulations lead to confusion in sizing equipment and practically eliminate any type of standardization. The compressors must be sized so that equipment can be moved on highways. Easy handling and mobility on location is necessary. Generally the compressors are sized to use from 150 to 350 hp. to satisfy most limitations.

When compressors are sized too large in individual units, malfunction in one compressor could shut down the entire air operations until repairs or replacements could be made. Air drilling may be continued with no loss of time by using smaller units in greater number. One small compressor down may not affect drilling conditions for several hours.

Horsepower requirements are an essential element in economical air drilling. Penetration rates, volume, pressure, and well conditions depend on available horsepower. Insufficient horsepower results in more rig down time. To determine amount of horsepower required, size and depth of hole, volume and pressures anticipated, types of formation and size of drill string should be taken into consideration. The horsepower of compressor equipment could vary from 50 to as much as 1,500 hp.

Pressure and temperature . . . Low-pressure compressors of 125 psi. or less are not usually sufficient for air drilling. Higher pressure compressors are needed. A working pressure of 150 to 500 psi. is desired in most air-drilled wells. In mist, slug, or aerated fluid drilling, high-stage compressor or boosters capable of 1,500 psi. are required.

Compressing air from atmospheric pressure to air-drilling pressures develops high temperatures.

All air compressors used in air drilling should have intercoolers and aftercoolers and automatic unloaders. The unloaders should be set at 10 psi. above maximum compressor working pressure and checked frequently. Maximum temperature for safe air drilling is 150° F. Lower temperatures are desirable.

Condensation to some extent is present in all air compressors. Each compressor should be equipped with a scrubber or knockout bottle, in order to break out and drain fluids from the air system. In humid summer weather the condensation becomes greater and requires frequent drainage of fluids. When condensation is not controlled during dry drilling, enough moisture could reach the formation to cause the cuttings to ball up.

Wellhead equipment . . . The wellhead equipment required for air or gas drilling depends on hole depth, size, and anticipated pressures. Two types of wellhead hookups are recommended with variations.

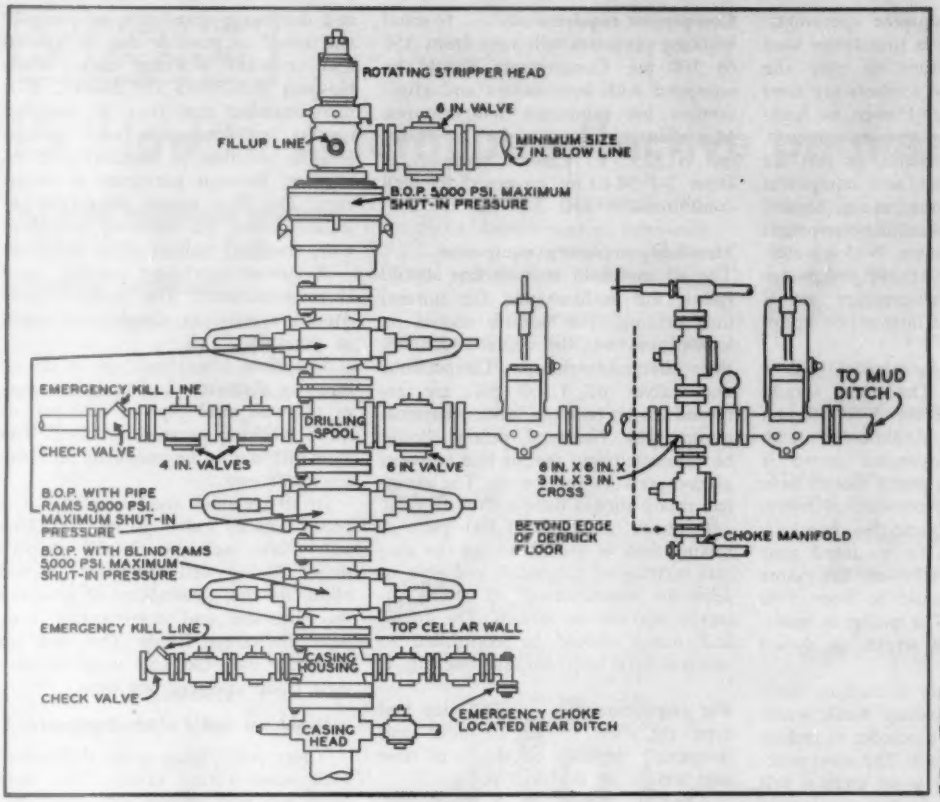
1. Low pressure well hookup. The accepted wellhead assembly for low-pressure areas is a 3,000-psi. working pressure (see Fig. 3).

2. In high-pressure areas, the accepted wellhead is a 5,000-psi. pressure (see Fig. 4).

These wellhead assemblies have been proven satisfactory in practice and should meet all emergency conditions when maintained in normal working order. All blowout preventers should be equipped with closing manifold operated by hydraulic oil in a closed fluid system.

The flow line should have an internal area as large or larger than the area of the annulus. The minimum length of flow line should be 150 ft. The flow line should be securely anchored.

The drill string used in air or gas


ROTATING STRIPPER HEAD
6 IN. VALVE
FILLUP LINE
MINIMUM SIZE 7 IN. BLOW LINE
B.O.P. 5,000 PSI. MAXIMUM SHUT-IN PRESSURE
EMERGENCY KILL LINE
DRILLING SPOOL
CHECK VALVE
4 IN. VALVES
6 IN. VALVE
6 IN. X 6 IN. X 3 IN. X 3 IN. CROSS
TO MUD DITCH
B.O.P. WITH PIPE RAMS 5,000 PSI. MAXIMUM SHUT-IN PRESSURE
BEYOND EDGE OF DERRICK FLOOR
CHOKE MANIFOLD
B.O.P. WITH BLIND RAMS 5,000 PSI. MAXIMUM SHUT-IN PRESSURE
EMERGENCY KILL LINE
TOP CELLAR WALL
CASING HOUSING
CHECK VALVE
EMERGENCY CHOKE LOCATED NEAR DITCH
CASING HEAD

RECOMMENDED blowout - preventer hookup for air-gas-mist drilling, 5,000-psi. working pressure. Fig. 4.

drilling is the same as would be used in good drilling practices with fluid. Some consideration should be given to the additional weight involved, as air or gas gives no flotation.

Drill pipe . . . The drill pipe should have tapered tool joints or bottle-neck pipe to avoid undue wear on the rotating head rubber. Drill-pipe rubbers are not recommended as they are pulled loose by the stripper rubber. The drill pipe should be as large as practical to reduce internal friction and annulus area. This reduces the horsepower needed to clean the hole.

Drill collars . . . The drill collars should be as large as practical for stabilization. Enough collars should be used to apply maximum bit weights. A float is essential and should be inspected each trip. Metallic-type thread dope is best for drill collar and pipe.

Reamers, stabilizers . . . In areas of crooked hole, the "packed hole" principle is recommended. Generally a diamond or roller-type reamer is run above the bit and a boot-type stabilizer or a reamer 30 ft. up. Should hole continue to deviate to maximum limits, the pendulum effect may be used to control inclination from vertical.

Bits . . . Bits used in air or gas drilling are of the hard formation type. The smaller, harder teeth and larger bearings give longer bit life with no sacrifice in penetration rate. These bits are used in the soft to medium-hard formations. The tungsten carbide insert-type bit is generally used in hard formations and in deeper wells. The insert-type bit gives faster penetration rates, longer bit life and more gage protection.

Hammerdrill . . . The hammerdrill is used in medium-hard to hard formations. It combines the percussion and rotary methods of drilling. The tool is run directly above the bit. When this tool is run, air or gas pressure and volume are increased. The additional pressure is required to operate the hammer, and additional volume is needed to clean the hole, as penetration is faster and cuttings are large.

Surface equipment . . . The surface equipment should be selected with care. A straight kelly is essential and a hexagonal kelly is preferable. In gas drilling, the rotary hose may be damaged by deterioration from hydrocarbons, making it necessary to use an all-purpose steel rotary hose.

Instrumentation . . . The drill-time record is the first indication of a different formation. This instrument is widely accepted and is important for drilling evaluation in air and gas drilling. The torque gage is important in determining a dull or out-of-gage bit, or a hole that is not being cleaned. The weight indicator must be sensitive where light weights are run, as in crooked hole.

A low-pressure gage is necessary on the stand pipe as pressure range in the low hundreds rather than in the thousands.

In gas drilling a flow-line meter is necessary to determine volume.

A temperature gage on the flow line gives indication of a wet zone; however, the cessation of dust is usually sufficient to indicate this condition.

Interstage pressure gages are used on the compressors to determine valve malfunctions. A temperature gage will also indicate a bad valve.

Other Equipment

The equipment used with chemicals in air and gas drilling is varied in application. Equipment is needed for squeezing water zones, mist drilling, and solid injection of dry chemicals.

Water shutoff involves equipment

generally used in squeeze operations. Logging equipment is sometimes used in squeeze operations to pick the zone of water entry. Packers are used to isolate the zone. Pumps or high-pressure gas is used for the squeeze.

When cement, plastics, or gels are used, the techniques and equipment are much the same as a normal squeeze with special mixing equipment necessary in some cases. With a water-sensitive gas, either a pump and pump-down plug or high-pressure gas is used as a flush and little other equipment is necessary.

Foaming agent is injected with a small fluid pump. The pump should have a range of from 2 to 20 bbl. of fluid per hour. A connected steam pump or an air-operated pump is normally used. The pump should have a 500-psi. working pressure or more. A mixing tank to blend the chemicals with water should be mounted near the pump, preferably on the same skid. This tank should be from 5 to 20-bbl. capacity. The pump is manifolded into the gas stream as shown in Fig. 1.

The solids injector is used to inject powders for controlling weak water zones or to adjust a powder to reduce torque in deeper wells. The most practical machine used is an endless belt with pistons to inject the powders in a constant-measured amount. This machine is shown tied into the air or gas line in Fig. 1.

In some areas where the humidity is continuously high, an inline scrubber is necessary with air compressors to insure that air is dry as possible. This scrubber must be of sufficient working pressure and large enough to handle the volume. The scrubber is hooked into the air line near the well to allow the air to cool.

A wellhead testing tool is now available to allow testing of all blowout equipment with fluid pressure. With this tool only a minimum amount of water is lost into the hole. After several days of dry drilling, the tool should be used to determine whether any flanges or connections have worked loose. On many wildcat wells, this procedure is used at predetermined intervals.

An automatic driller can mean extra footage in most cases. It is particularly important when light weights are being run.

Deepening and Cleanout

A direct descendant of air and mist drilling is air cleanout and deepening. This method is often the quickest and most effective procedure in remedial work. Equipment requirements for air cleanout and deepening are similar to mist-drilling practices.

Compressor requirements . . . Normal working pressures will vary from 350 to 500 psi. Compressors should be equipped with intercoolers and aftercoolers for minimum temperatures. Maximum temperature for air cleanout is 125° F. Volume normally is from 2-3 M.c.f.m. governed by well conditions.

Manifold, accessory equipment . . . The air manifold and air line should follow the outline used for normal mist drilling. The booster should be located between the compressors and the chemical pump. Connections and valves of 1,500 psi. are required for booster and chemical pump. The chemical pump should be connected into the air line between all compressors and the rig. The chemical pump should have a shutoff valve and check valve of 1,500 psi. A mixing tank is needed to get the correct mixture of chemicals and give an accurate measurement of fluids injected into the air stream. The chemical pump should be controlled to reach desired injection rate. See Fig. 1.

Rig requirements . . . The size and type rig used in air cleanout and deepening depends on depth of hole and weight of the drill string.

The rig should be a rotary-type rig or equipped with rotary attachment. Power swivels are recommended in air cleanout and deepening.

The drill string will usually consist of the production tubing. The tubing should be in good condition and checked for holes and damaged joints. When production string of tubing is used, a torque gage should be used on rotary equipment to prevent damage to tubing.

The drill string should contain a float sub above the jet sub in air cleanout. A float is essential at all times in air cleanout and deepening. A jet sub is recommended for air cleanout.

Bits, collars . . . In cleanout operations the bit is used very little to drill and requires no specific design. However, the water courses should be full opening to accommodate greater volumes of air.

In air-and-gas deepening, it is recommended that at least 60 ft. or more drill collars be used for stabilization and weight. The sizing of the drill collars depends upon the hole size and annulus clearances. A float should be installed in the bottom drill collar just above the bit.

Wellhead equipment . . . The wellhead equipment used in air cleanout and deepening should be as compact and small as possible due to limited and crowded working area. When blowout preventors are desired, it is recommended that they be installed on the well casing as near ground level as possible. A bleedoff line below the blowout preventor is necessary. The flow nipple should be installed above the blowout preventor with flanges.

A rubber-insert-type packoff head is recommended. The packoff head should remain as simple and small as possible.

The flow line should be 6 in. or more in diameter. Lightweight casing or thinwall steel pipe of 500 psi. or more working pressure is used. The flow line should be anchored near the discharge end.

In air cleanout and deepening, it is recommended a steel pit be used. This will allow recovery of all oil produced during well operations. It will eliminate the possibilities of spraying the location and surrounding area with discharged fluids. The steel pit is easily movable and requires very little rigup and rigdown time.

Problems and Future Equipment

There have been some difficulties with small rotary tables. The table must be large enough to allow passage of the rotating head.

Substructures are generally too low to accommodate all the blowout preventors and the rotating head. It is often necessary to raise them to have part of the preventor equipment in the cellar. Compressor weight is an important consideration in transportation. Drill-string strength is a problem in deeper wells. In some cases, the drill pipe is the limiting factor for the depth that air or gas may be used.

The advent of the Hammerdrill has thrown open the door for new bit designs. Several thousand feet per bit may be expected. A top-hole float will be built that will allow slope tests without undue loss of time.

A shorter rotating head is expected. This will be prelubricated and relatively maintenance free. A new-type blowout hookup making the wellhead equipment shorter, more compact, and easier to install is desired.

An efficient separator to clean the dust and cuttings from gas so the gas can be returned to the pipeline is needed. New chemicals and chemical injectors will be available for water problems thus creating numerous new areas for air and gas.

A bottom-hole recording gage to obtain pressure and temperature at the bit, both inside and outside, would give more engineering information on future tool designs.

RESERVOIR Engineering

15. How to determine effective permeability

(e.) From multiphase pressure-buildup data under finite boundary conditions

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GIVEN: A pressure-buildup test was performed on a well producing oil and free gas into the well bore. The data obtained were as follows:

Time after shut-in, θ hrs.	Sand-face pressure, psig.
.00	1,420
.02	1,500
.03	1,600
.05	1,650
.10	1,695
.20	1,735
.50	1,770
1.00	1,800

Other Data

Estimated average reservoir pressure,

$$p = 1{,}840 \text{ psi.}$$

Reservoir fluid saturations

$$\text{oil, } S_o = 60.1\%$$
$$\text{gas, } S_g = 15.4\%$$
$$\text{water, } S_w = 24.5\%$$

Fluid-production rates,

oil, 900 bbl. per day = Q_o
water, 0 bbl. per day = Q_w
gas, 6,050 s.c.f./bbl.

Viscosity of oil at reservoir conditions,

$$\mu_o = 0.6 \text{ cp.}$$

Net oil sand thickness,

$$h = 21 \text{ ft.}$$

Solution gas-oil ratios, R_s, s.c.f. per stock-tank barrel.

at 2,000 psi. = 480.
at 1,500 psi. = 340.
at 1,840 psi. = 440.

Oil formation-volume factor, β_o.

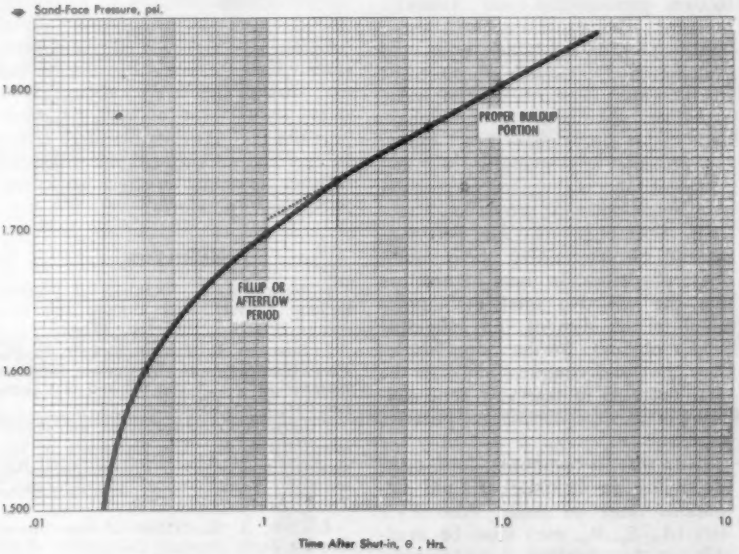
at 2,000 psi. = 1.32.
at 1,500 psi. = 1.25.
at 1,840 psi. = 1.30.

Gas formation volume factor at average reservoir conditions,

$$\beta_g = 1.50 \times 10^{-3} \text{ Res. bbl. s.c.f.}$$

Water compressibility factor at average reservoir conditions,

$$c_w = 3.0 \times 10^{-6} \text{ vol./vol./psi.}$$



MULTIPHASE pressure-buildup curve.

Water compressibility factor at average reservoir conditions,

$$c_w = 2.0 \times 10^{-6} \text{ vol./vol./psi.}$$

Porosity,

$$\phi = 0.16$$

Radius of drainage, $r_e = 400$ ft.

Use finite case of no influx of fluid over the drainage radius.

FIND: Effective permeability to oil and the static reservoir pressure.

Method of Solution

Equations needed for the solution are:

$$\text{Slope} = m = \frac{p_2 - p_1}{\log \theta_2 - \log \theta_1} \quad (1)$$

$$k_o = \frac{162.6\, Q_o\, \mu_o\, \beta_o}{m\, h} \quad (2)$$

$$T = \frac{0.000264\, M_T\, \theta}{\phi\, c_T\, r_e^2} \quad (3)$$

$$p_* = p_* + \frac{(\Delta p_*)\,(m)}{1.15} \quad (4)$$

Where:

$$M_T = M_o + M_g + M_w \quad (5)$$

$$M_o = \frac{162.6\, \beta_o\, Q_o}{m\, h} = \frac{k_o}{\mu_o} \quad (6)$$

$$M_g = \frac{162.6\, (\beta_g)\, (Q_g - Q_o\, R_s)}{m\, h} = k_g/\mu_g \quad (7)$$

$$M_w = \frac{162.6\, \beta_w\, Q_w}{m\, h} = \frac{k_w}{\mu_w} \quad (8)$$

$$C_T = c_{of} + c_{gf} + c_{wf} \quad (9)$$

$$c_{of} = (S_o/100) \times \left[\frac{\beta_g}{\beta_o}\frac{dR_s}{dp} - \frac{1}{\beta_o}\frac{d\beta_o}{dp}\right] \quad (10)$$

$$c_{gf} = S_g/100\,(1/p) \quad (11)$$

$$c_{wf} = \frac{S_w}{100}\, c_w \quad (12)$$

θ = time after shut-in, hours.

k_o = effective permeability to oil, md.

$d\beta_o/dp$ = slope of β_o vs. p plot at average reservoir pressure.

dR_s/dp = slope of R_s vs. plot at average reservoir pressure.

T = dimensionless time.

M_T = total mobility.

M_o, M_g, M_w = mobilities of oil, gas, and water.

P_2, p_1 = pressures at shut-in times Q_2, Q_1.

c_T = effective total compressibility factor, vol./vol./psi.

Q_o, Q_w = production rates of oil and water, bbl./day.

Q_g = gas-production rate, standard cu. ft. per day.

β_w = water formation volume factor.

c_{of}, c_{gf}, c_{wf} = oil,* gas, and water fraction compressibilities, vol./vol./psi.

All of the other factors were defined with the data.

SOLUTION: From plots of β_o vs. p and R_s vs. p, these slopes are obtained: $dR_s/dp = 0.28$ and $d\beta_o/dp = 0.00014$. Substituting these and other factors in Equation 10,

$$c_{of} = (60.1/100) \times \left[\frac{(0.0015)}{1.3}(0.28) - \frac{1}{1.3}(0.00014)\right]$$

$$= 1.29 \times 10^{-4} \text{ vol./vol./psi.}$$

$$c_{gf} = (15.4/100)\,(1/1{,}840) = 0.84 \times 10^{-4} \text{ vol./vol./psi.} \quad (11)$$

$$c_{wf} = (24.5/100)\,(3.0 \times 10^{-6}) = 0.007 \times 10^{-4}$$

$$\sim 0.01 \times 10^{-4} \text{ vol./vol./psi.} \quad (12)$$

$$c_T = (1.29 + 0.84 + 0.01)\,10^{-4} = 2.14 \times 10^{-4} \text{ vol./vol./psi.} \quad (9)$$

On the graph, extrapolating the proper buildup portion of the curve to $\theta = 0.1$ and using abscissa values of 0.1 and 1.0 gives a slope of:

$$m = \frac{1{,}798 - 1{,}707}{\log 1.0 - \log 0.1} = \frac{91}{1.0} = 91 \quad (1)$$

$$M_o = \frac{(162.6)\,(1.3)\,(900)}{(91)\,(21)} = \frac{k_o}{\mu_o}$$

$$= 100 \text{ md./cp.} \quad (6)$$

*This use of the term oil compressibility factor is different from the normal usage in that changes in solution-gas content and shrinkage are considered together.

$$M_g = \frac{(162.6)\,(0.0015)\,[(900)\,(6{,}050) - (900)\,(440)]}{(91)\,(21)} = \frac{k_g}{\mu_g} \quad (7)$$

$$= 644 \text{ md./cp.}$$

$$M_w = 0 \text{ because } Q_w = 0$$

$$M_T = 100 + 644 = 744 \text{ md./cp.} \quad (5)$$

$$\text{Effective permeability} = k_o = \frac{(162.6)\,(900)\,(1.3)\,(0.6)}{(91)\,(21)} \quad (2)$$

$$= 60 \text{ md.}$$

For shut-in time of 0.5 hour, dimensionless time becomes:

$$T = \frac{(0.000264)\,(744)\,(0.5)}{(0.16)\,(2.14 \times 10^{-4})\,(400)^2} \quad (3)$$

$$= 1.79 \times 10^{-2}$$

From Fig. 3 of Reference 2,

$$\Delta p_s = 0.90$$

Then static reservoir pressure in drainage area is:

$$p_s = 1{,}770 + \frac{(0.90)\,(91)}{1.15} \quad (4)$$

$$= 1{,}841 \text{ psi.}$$

This problem is an example of the analysis of multiphase pressure-buildup data for the determination of effective permeability and reservoir pressure. The equations used are a modification of the Miller, Dyes, and Hutchinson[2,3] approach as presented by Perrine.[1] Essentially the same equations are used for multiphase flow as for single-phase flow[2] except that effective total mobility (M_T) and compressibility (c_T) are used for equivalent single-phase oil properties. Equations 5 through 12 are Perrine's[1] method of determining these multiphase properties. In them he assumes that the effective total mobility is equal to the sum of the individual fluid mobilities. Furthermore, he defines the total compressibility as the total decrease in reservoir fluid volume per unit volume per psi. pressure increase.[1]

Note that in computing total compressibility an estimate of fluid saturations must be made. Also PVT data (β_o, β_g, R_s, etc.) must be available or be obtained from correlations. Fluid saturations can be determined from a material balance involving initial saturations and production data. All fluid factors in the equations that are a function of pressure are obtained at estimated average reservoir pressure, which can be obtained from an extrapolation of a pressure-vs.-time curve or from recent measurements on nearby wells.

It is of interest to note that the completed static reservoir pressure (1,841 psi.) agrees very well with the estimated average reservoir pressure (1,840 psi.). Also note that in addition to effective oil permeability, effective gas permeability could have been computed from Equation 7 if the gas viscosity at reservoir conditions were known. Thus it is possible by this approach to determine specific values of k_g/k_o and also k_w/k_o. These could serve as a check of specific values determined by laboratory methods.

In spite of the fact that the gas saturation is only one-fourth the oil saturation (liquid plus solution gas) the contribution of the former to the total compressibility is practically equal to that of the latter. It is interesting to note that both are many times that for a liquid alone. The mobility of the gas is more than six times that of the oil. Work performed by R. E. Cook[4] shows that use of single-phase instead of multiphase compressibility, even when producing gas-oil ratios are at or near initial solution values results in static pressures which are low. Cook also found that except for large buildup curve slopes (100+) and/or very low crude gravities (20° API) rather large errors in gas saturation can be tolerated without appreciable effect on calculated static pressures.

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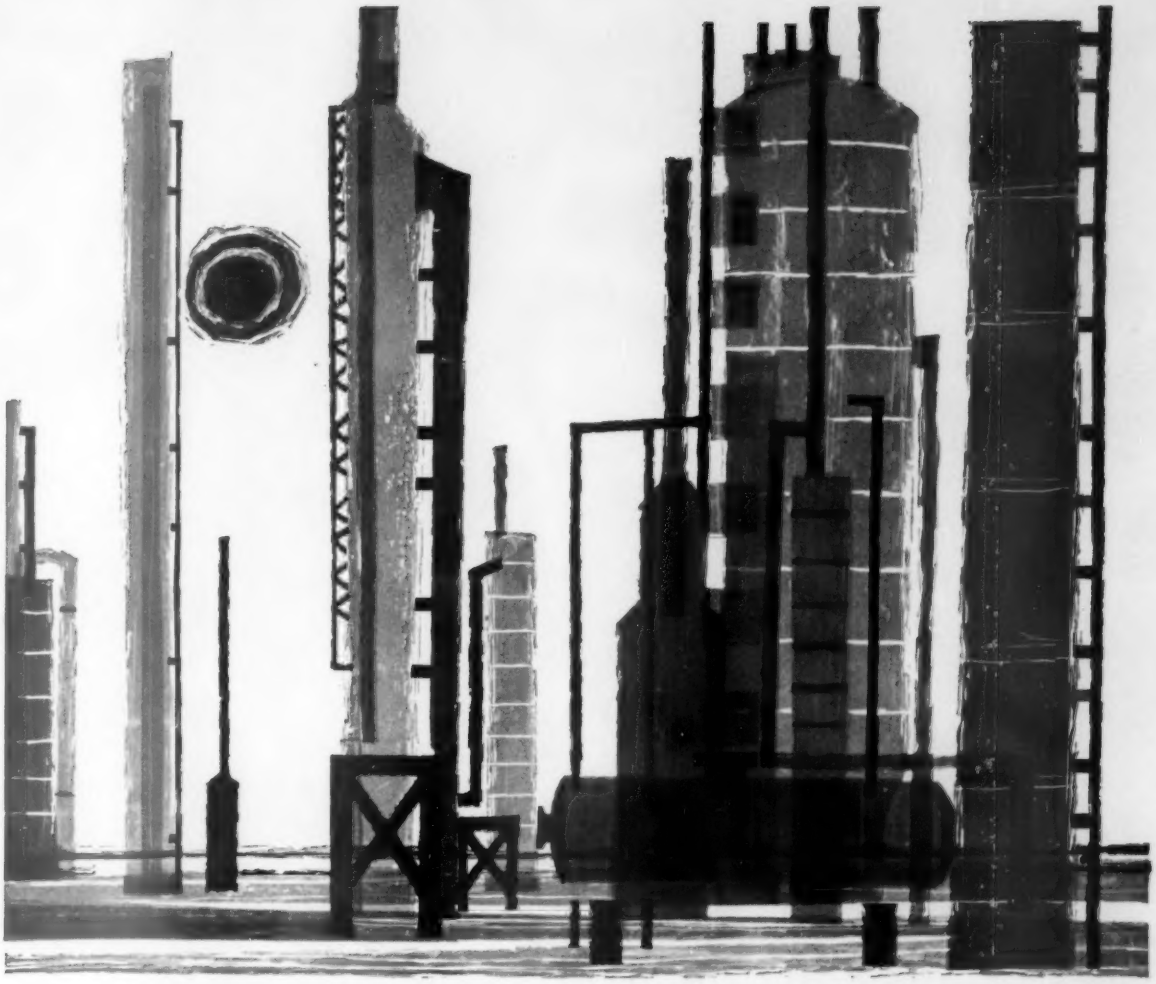

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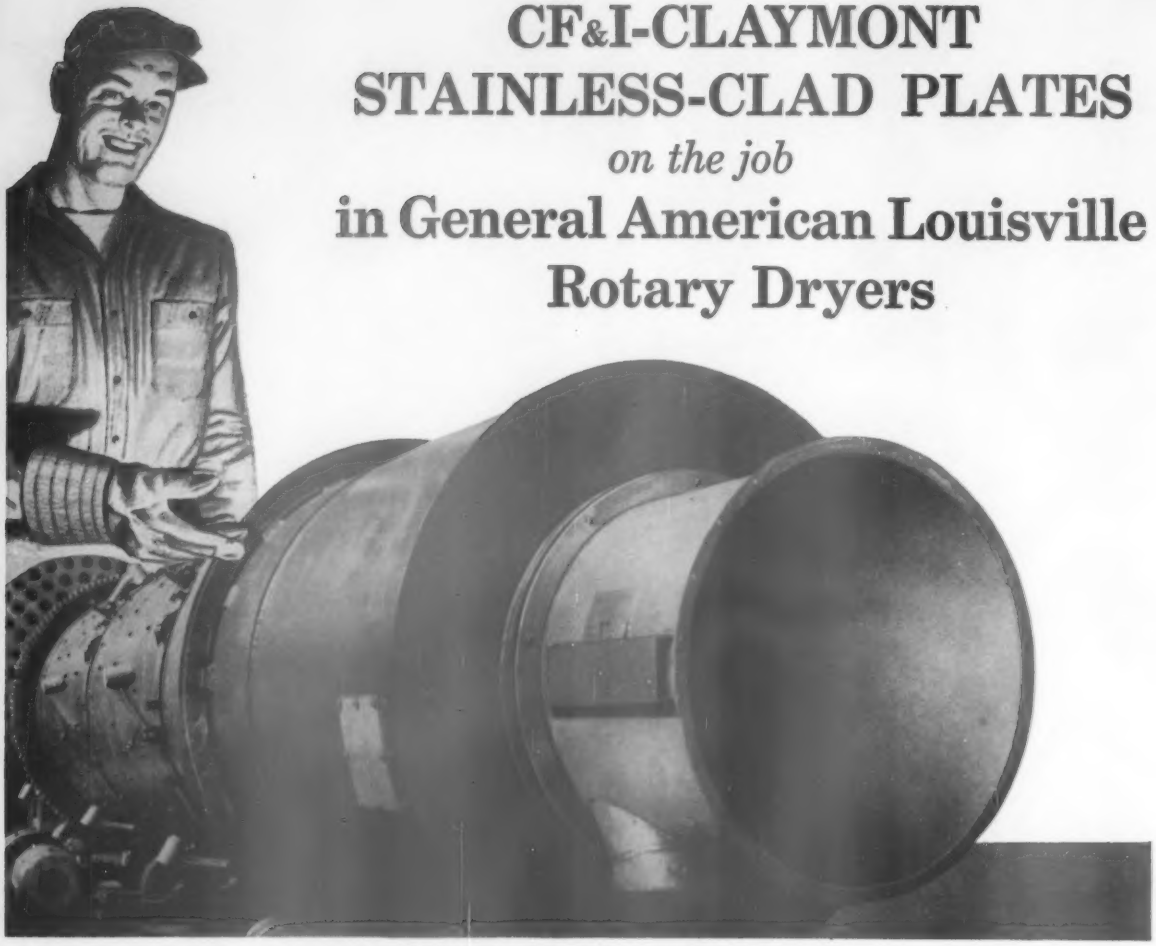

This warm air dryer, built by the Louisville Dryer Division of General American Transportation Corporation, was fabricated from Claymont Stainless-Clad Steel Plates. The plates consist of a ¼" thick cladding of type 304 stainless, bonded to a 1" plate of flange-quality carbon steel.

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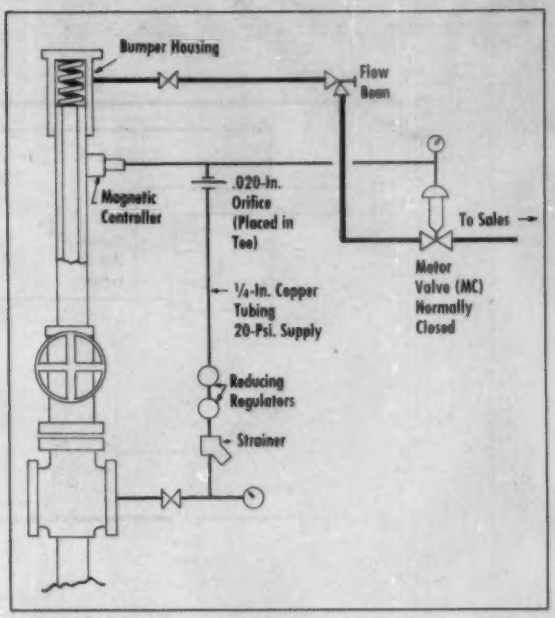
Free piston removes accumulated liquid from gas wells

Operating principles of the free piston were covered in the first part of this article last week. Here are the operation and installation details.



ARRANGEMENT of surface equipment for freewheeling or continuous cycling. Fig. 1.

PART 2 OF TWO PARTS

BY CARROLL M. BEESON
Petroleum Engineering Department, University of Southern California, Los Angeles
and
DONALD G. KNOX
National Supply Co., Los Angeles

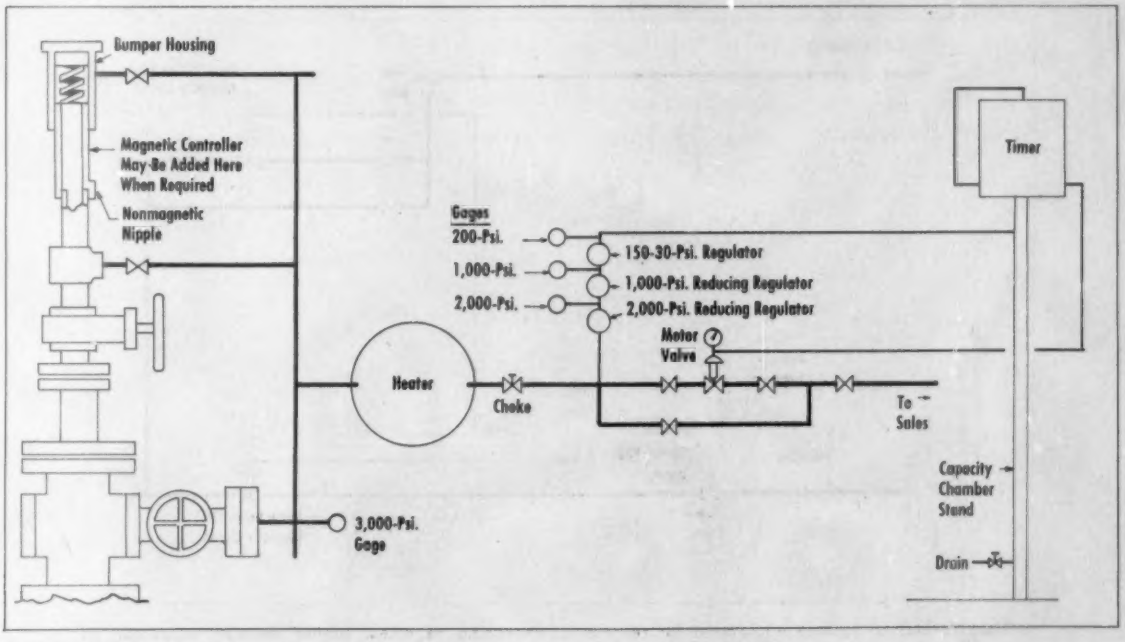
THERE ARE three principal methods[1] of installing Plunger Lift* in a gas well. A choice among the methods depends upon field conditions, bottom-hole pressure, and whether or not the well makes sand. These methods are:

1. Freewheeling or continuous cycling.
2. Stopcocking gas flow through tubing to sales line, either with straight time control or with magnetic control incorporated to close tubing as plunger surfaces.
3. Casing to sales, tubing to sales or sump, either with direct flow or with reverse flow.

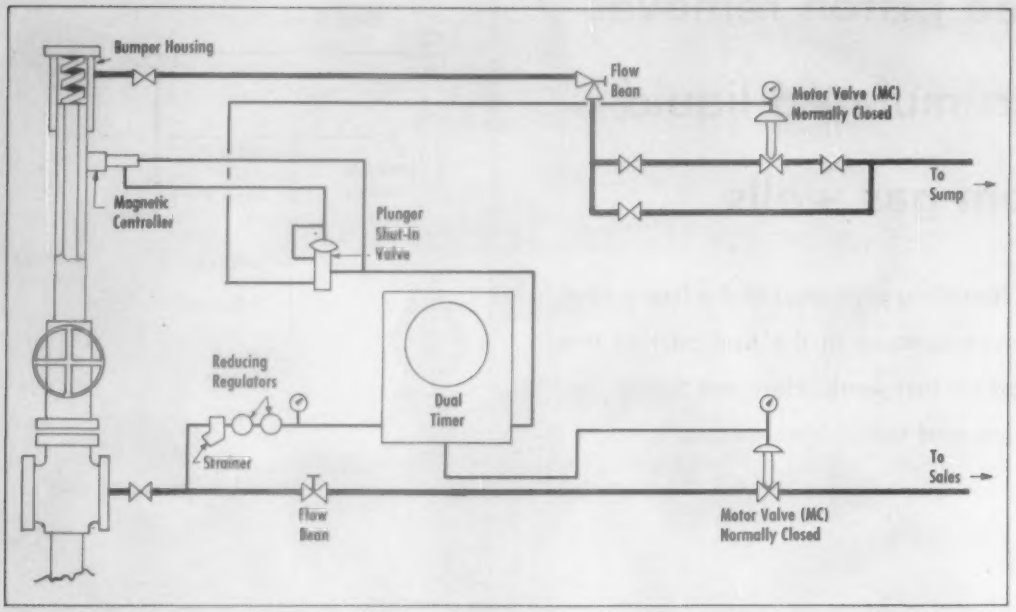
In the newer reverse flow, gas production from the casing is interrupted by a dual timer long enough to reverse the flow of liquid entrained in the gas and drive it from the annulus into the tubing, while the casing pressure is being raised to a value that insures lifting the plunger at the proper speed.

Reverse flow applies principally to those wells that produce less than

*Plunger Lift is a registered trade mark of National Supply Co.



ARRANGEMENT of surface equipment for stopcocking gas flow to sales line. Fig. 2.



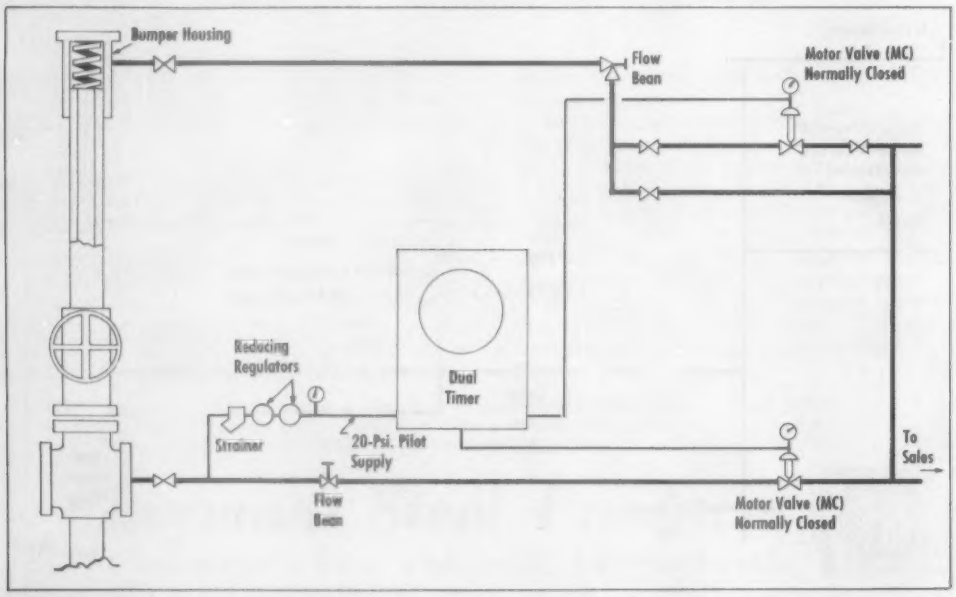
THIS is the surface-equipment arrangement recommended for reverse flow—casing to sales, tubing to sump. Fig. 3.

about 24 bbl. per day of liquid. This is due mainly to the time required in building the casing pressure from that of the sales line to the value necessary to lift the load. Time is also involved in driving the fluid down out of the annulus into the tubing.

If throughout the day, the total time required for pressure buildup and reverse flow is long, the average casing pressure and pressure exerted on the formation may be higher than would be the case for the older method of direct flow with a single timer. The newer method is always applicable where the sales-line pressure is relatively high and the tubing is discharged to a low-pressure separator or to a sump. In this situation, the casing pressure is always sufficient to lift loads periodically.

These methods generally require intermittent production of at least part of the gas. Intermittent operations for lifting liquids from gas wells are in such general use that they have been accepted by most operators. Accordingly they have learned how to handle the effect of gas surges on compressors and lines.

For example, time controllers of a group of wells are often set so that each well in the group intermits at a different time. This helps to smooth out the effect upon compressors and gas-gathering systems.



ARRANGEMENT of surface equipment for reverse flow—casing to sales, tubing through separator to sales. Fig. 4.

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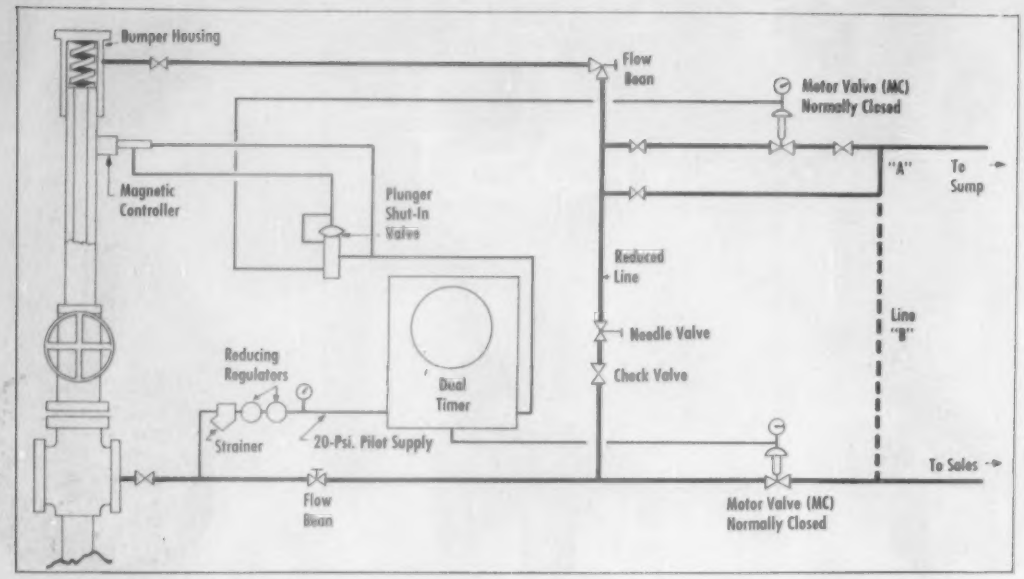


FOR WELLS MAKING SAND, this arrangement of surface equipment is recommended for reverse flow—casing to sales, tubing to sales or sump. Fig. 5.

Dual Timer

In many gas wells using free pistons with a single timer the piston rose too slowly. When the timer closed the sales-line valve and simultaneously opened the tubing, there was not enough pressure differential to lift the plunger fast enough to prevent the gas from bypassing the piston.

This bypassing and the drop in pressure along the plunger often caused hydrates to form, preventing the piston from reaching the surface. Sufficient differential pressure could be maintained in normal operations by beaning the gas flow from the casing to the sales line. This was not always practical, however, nor did it permit attaining the lowest average operating pressure.

A difficulty which was just as serious but not so apparent was the entrainment of fluid in the annulus. Gas flowing up the annulus at high rates for long periods entrains fluid for several thousand feet. Much time would be needed to drive the fluid down and into the tubing.

To overcome these difficulties, a timer was modified so that it contained both a casing-time wheel and a tubing-time wheel. The installation of the two time wheels in the same case permitted setting and maintaining the time wheels in the desired relation.

Operation with dual timer . . . With a dual timer the plunger may rest on bottom while gas flows from the casing to sales, Figs. 3 and 4. After chosen time intervals the well is shut in for the well to build up the casing pressure to the value required for surfacing the plunger with its load. The tubing is then opened. When the plunger arrives in the bumper housing, the tubing is shut in instantly, see Fig. 3, or shortly thereafter, see Fig. 4, and the casing is again opened to sales when the plunger reaches the well stop.

With a dual timer for sandy wells, the plunger is held in the bumper housing while gas flows from casing to sales, see Fig. 5. After chosen time intervals the well is shut in. This allows the plunger to fall to bottom while sufficient pressure builds up in the casing to surface the plunger with its load. The plunger is held in the bumper housing by permitting sufficient gas to bleed through the reduced line which is inserted between the tubing and casing lines.

Dual-timer advantages . . . While the tubing is closed in, casing pressure is raised until it insures lifting the plunger at a speed of 800 to 1,200 ft. per minute, and thus avoids serious bypassing of gas. This almost invariably prevents plunger sticking, even if hydrates are present.

The intermittent rise of casing pressure before the tubing is opened drives the fluid out of the annulus into the tubing for the next plunger cycle. This removal of liquid from the gas reduces the pressure exerted by liquid on the formation. In addition, drier gas is obtained, since the annulus acts as a separator.

Descriptions of the various methods of installing free plungers in gas wells follow:

Free Wheeling or Continuous Cycling

Operation: When the plunger contacts the magnetic control, the motor valve partially closes. This permits the plunger to drop free of the mechanical opener. The motor valve opens again as soon as the plunger leaves the magnetic control. The bean must be regulated to throttle the gas flow, so the plunger may fall through the gas stream.

Surface equipment, Fig. 1: (1) Flow bean, (2) bumper housing with mechanical opener, bumper spring and magnetic trigger, (3) expanding plunger, (4) normally closed motor valve, (5) pressure regulator and the necessary copper tubing to supply gas at 20 psi. to hold the motor valve open, (6) reducing orifice (0.020 in.) to be placed downstream of pressure regulator and teed into the diaphragm and then to the magnetic-control pilot valve.

Subsurface equipment: (1) Any API holddown shoe or Otis stop to be set near the bottom of the tubing, (2) foot-piece assembly to be attached to the holddown shoe or stop.

Application: Freewheeling is used where there is sufficient volume and pressure of gas to lift liquid against the pressure of the sales line. This method also is used where there is no annulus, as in two-zone completions. Freewheeling, wherever feasible, is used when economy of investment is a major item of concern, but it

does not have the positive-control feature that stopcocking offers.

Stopcocking Gas Flow Through Tubing to Sales Line

Operation with straight time control: The plunger is held in the bumper housing for any desired length of time by the flow of gas to the sales line. The timer is set to close in the tubing for a period of time which will permit the plunger to reach the foot piece. The timer then opens the motor valve, allowing the plunger to surface with liquid. The timer holds the motor valve open to permit the flow of gas to the sales line, and then repeats the cycle.

This method permits the flow of gas, with minimum restriction, to pass under the plunger while it is in the bumper housing. The solid brush-seal plunger is generally used for this application in a well producing considerable gas and a small volume of water. High bottom-hole pressure is required for this method.

Surface equipment for straight time control, Fig. 2: (1) Bumper housing without either mechanical opener or magnetic control, (2) high-pressure tee to be placed between the stack nipple and the master gate (this tee is not necessary if the flow is through the wing gate of a standard christmas tree), (3) flow bean, (4) motor valve, normally closed, (5) pressure regulator for pilot-supply gas at 20 psi., (6) timer with 7-day-clock wind.

Subsurface equipment: (1) Any API holddown shoe or Otis stop, (2) foot-piece assembly to be attached to the holddown shoe or stop (this assembly is not required in case a brush-seal plunger is used).

Application: Straight time control is used in wells producing large volumes of gas. From 15 to 24 bbl. per day of condensate or water may be produced by this method under normal conditions.

Reverse Flow—Casing to Sales, Tubing to Sump (For Lowest Operating Pressure)

Operation, Fig. 3: Gas flows from casing to sales line for desired period of time; plunger is on bottom (on foot piece). The casing motor valve is then closed by the timer and pressure is built up sufficiently to lift the fluid load. The MC motor valve is then opened on the tubing to permit the plunger to surface with fluid.

As soon as the plunger enters the bumper housing, the well is shut in by means of the magnetic control; this instantaneous closing avoids gas wastage. Shortly after the plunger reaches bottom, the casing valve opens to the sales line again.

Surface equipment: (1) Bumper housing with magnetic control (a mechanical opener included if a plunger with valve is used), (2) dual time-cycle intermitter with plunger shut-in valve, (3) plunger (as per requirements), (4) two MC motor valves (normally closed), (5) two flow beans, (6) pressure regulators and necessary copper tubing to connect 20-psi. pilot supply to controls.

Subsurface equipment: (1) A wire-line anchor stop, (2) foot-piece assembly (not required wherever brush - seal plunger is used).

Reverse Flow—Casing to Sales, Tubing Through Separator to Sales

Surface equipment, Fig. 4: (1) Bumper housing less magnetic control (a mechanical opener is included if a plunger with valve is used), (2) dual time-cycle intermitter without plunger shut-in valve, (3) plunger (as per requirements), (4) two MC motor valves (normally closed), (5) two flow beans, (6) pressure regulators and necessary copper tubing to hook up 20-psi. pilot supply to controls.

Subsurface equipment: (1) A wire-line anchor stop, (2) foot-piece assembly (not requires wherever brush - seal plunger is used).

Reverse Flow—Casing to Sales, Tubing to Sales or Sump (for Wells Making Sand)

Surface equipment, Fig. 5: (1) Bumper housing without mechanical opener (with magnetic control if fluid is to be discharged to sump), (2) dual time-cycle intermitter (with plunger shut-in valve if fluid is to go to sump), (3) brush-seal plunger, (4) two MC motor valves (normally closed), (5) two flow beans, (6) pressure regulators and necessary copper tubing to connect 20-psi. pilot supply to controls, (7) needle valve.

Subsurface equipment: (1) A wire-line anchor stop (foot - piece spring not necessary).

Note: A brush-type plunger should be used. The special bypass from tubing to casing permits holding the valveless plunger in bumper housing; this is essential for well making sand.

Stopcocking Without Plunger

Where a well has sufficient bottom-hole pressure to bring up comparatively large fluid loads periodically, good results may be obtained by stopcocking without the use of a plunger until the well pressure drops to a point where the introduction of a plunger becomes necessary. An installation as shown in Fig. 3 is recommended for this purpose.

In this hookup it may be desirable to bleed the pressure from the tubing, in which case a bypass (reduced pipeline) may be installed between the tubing and the casing, as shown in Fig. 5. This is done to reduce the tubing pressure to a minimum.

Reference

1. Bond, G. R., "Dewatering of Gas Wells by Plunger Lift," AIME paper presented to Pittsburgh meeting, November 7, 1958.

BOOKS

CONTINUOUS ANALYSIS OF CHEMICAL PROCESS SYSTEMS. By Sidney Siggia. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 381 pp. $8.50.

Details on all phases of the new analytical devices designed to attain economical, accurate, and continuous monitoring of chemical process systems are presented here. Differing from conventional lab devices, the continuous, on stream analytical instruments function automatically and directly in the processing equipment or pipeline. Recorder charts and dial readings permit a constant check of the chemical composition in process systems.

Information in this book, collected from journals, commercial literature, and personal communications, has been reviewed and approved by the instrument companies manufacturing continuous analytical devices, and is therefore considered authoritative and up to date.

Each instrument is described according to principle of operation, range of application, accuracy and precision, installation and construction specifications, time for response, use with controllers, versatility, and interferences.

Siggia also gives examples of use of each instrument in specific applications.

PETROLEUM REFINERY MANUAL. By Henry Martyn Noel. Published by Reinhold Publishing Corporation, New York. 182 pp. $7.95.

This manual presents an integrated picture of the operations, equipment, and economics of refinery design and construction, including brief descriptions of all the standard techniques and equipment used in petroleum processing.

Information on planning and constructing new refineries includes a discussion of estimating, scheduling, process and mechanical design, shop fabrication, (tanks, piping, pumps, instruments, etc.), and field construction. Particular attention has been given to figures covering operating and operating manpower costs for the refinery operation in its parts and as a whole.

The author has based his material on both large and small American and foreign refineries. Emphasis is placed on the newer refining processes, although the older methods are outlined for purposes of comparison.

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Operating cost of gas-compressor stations

THE COSTS of (1) labor, (2) supervision and engineering, and (3) maintenance (supplies and expenses) for gas pipeline transmission stations are indicated in Fig. 1 from Kinney and Reed, OGJ, July 13, 1959, p. 93. Note that the operating costs of Fig. 1 range widely (plus or minus over 50%). The compression costs of Fig. 2 were computed from Process Costimating issues No. 22 (October 20, 1958, p. 105), and No. 24 (August 25, 1958, p. 102).

The horsepower required to handle a million standard cubic feet per day with a suction pressure of 30 psia. is about as follows:

Pressure (psia.)	Hp. per M.M.s.c.f.
200	116
250	127
300	137
350	146
400	153
500	167
600	179
700	189
800	197
1,000	210
1,200	219

The cost (1946) of compressor stations—based on data in an OGJ article tentatively scheduled for Nov. 2, 1959—is about:

Hp.	Dollars per hp. 1946	1956
1,000	145	283
2,000	157	306
4,000	164	320
6,000	168	328
10,000	161	314
12,000	140	273

Example—The horsepower required for a 1,000-psia. station pressure when handling 50,000,000 cu. ft. per day is about:

$$210 \times 50 = 10{,}500 \text{ hp.}$$

The cost of compression for an average gas value of 20 cents per M.c.f. is about 0.77 cents per M.c.f. (Fig. 2—modern supercharged engines). Thus, the total operating cost during 1956 is shown in the tabulation below.

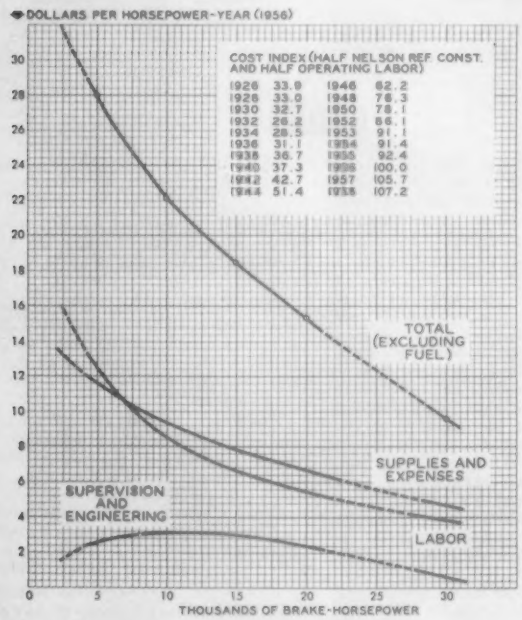
The total operating cost per station, as cents per M.c.f. is:

$$\frac{1{,}384.50 \times 100}{50{,}000} = 2.76$$

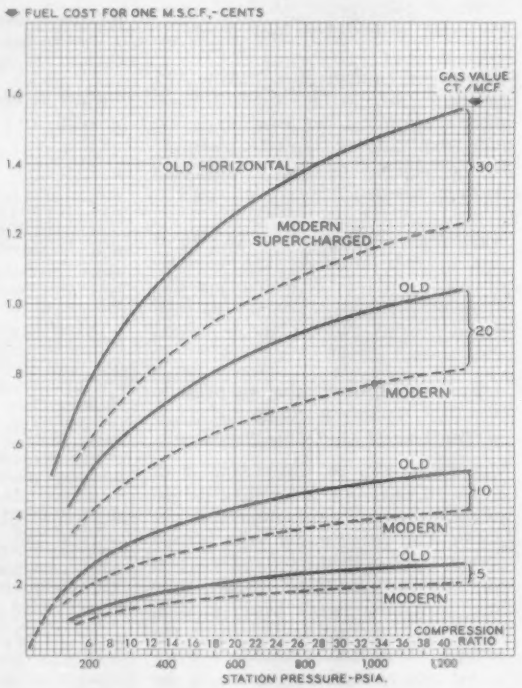
The pipeline-investment cost also contributes to the cost of gas compression.

TOTAL OPERATING COST DURING 1956

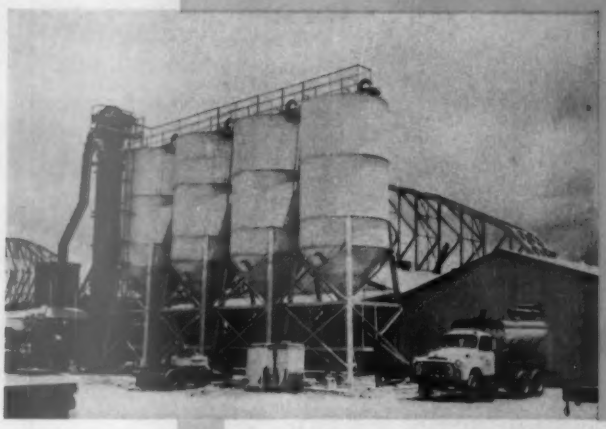
		Cost per day
Supervision and engineering	3.20 × 10,500/365 =	$ 92.00
Supplies and expenses	9.45 × 10,500/365 =	272.00
Labor	8.5 × 10,500/365 =	244.50
Miscellaneous (by difference)	=	30.00
Subtotal	22.2 × 10,500/365 =	$ 638.50
Compression	50,000 × 0.77/100 =	$ 384.00
Investment at 4%	314 × 10,500 × 0.04/365 =	362.00
Total	=	$1,384.50



LABOR, Supervision and engineering, and maintenance costs for gas pipeline transmission stations. Fig. 1.



COMPRESSION COSTS for gas pipeline transmission stations. Fig. 2.



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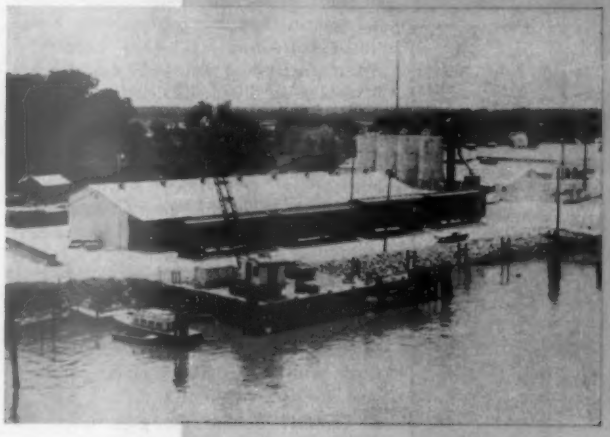

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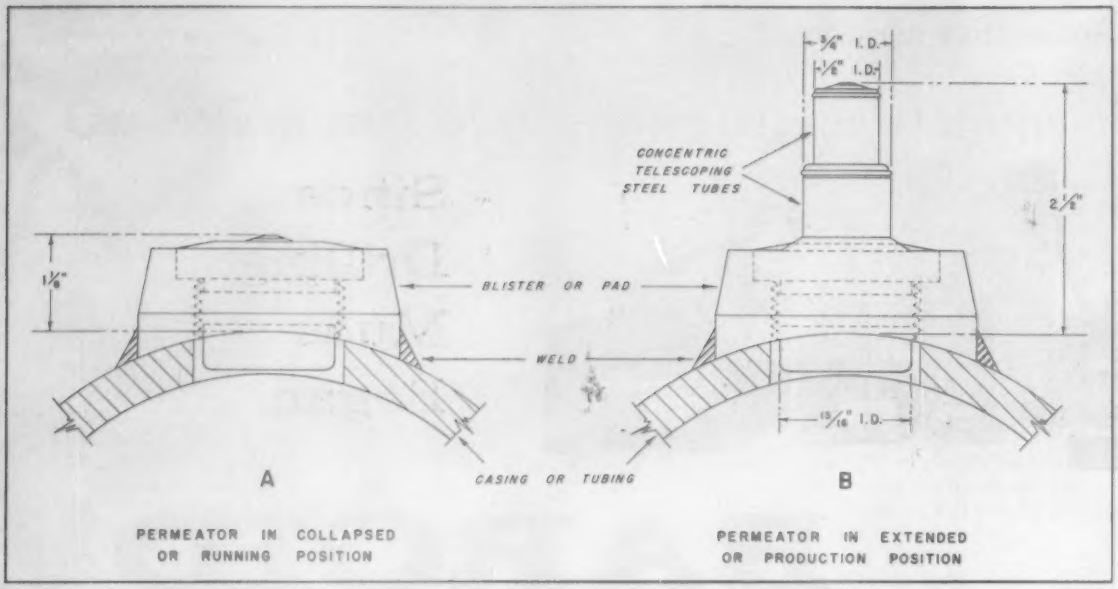


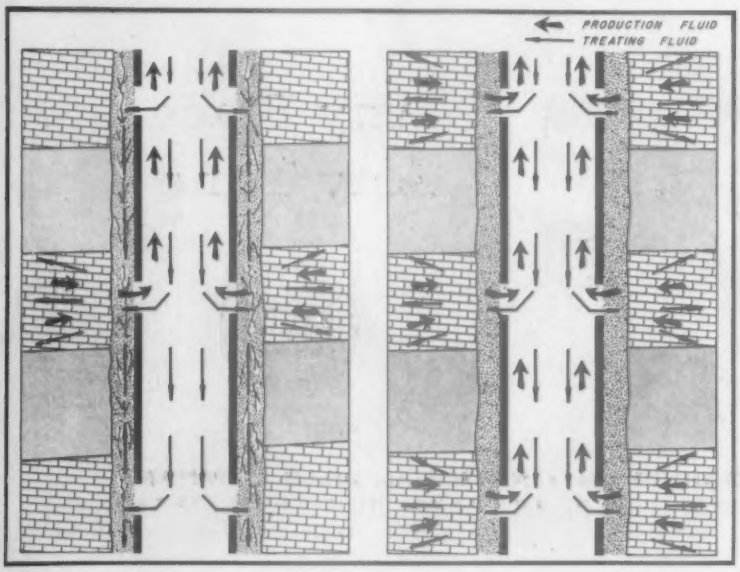
FIG. 1

The Permeator:

Pipeline to greater oil recovery

This new method of well completion has these advantages:

- No cement fracturing
- No casing burrs
- No "junk" in the hole
- Cement protected from acid attack
- Automatic casing centralization
- Machined seat for ball sealers
- Uniform diameter of perforations
- Ideal for multitubingless completions.



IF CEMENT behind the pipe is damaged during conventional perforation, treating and production fluids may be concentrated in one zone as at left. Sketch at the right shows the ideal case, with each producing zone receiving and contributing its full share. Fig. 2.

A NEW field-proven method of well completion uses a new development, the Permeator, to provide casing perforations without damaging the cement.

When installed in the well, these Permeators create miniature pipelines from the producing formation to the well bore, eliminating all contact between well fluids and the cement behind the casing.

The permeator, developed by S. Myron Zandmer, president, National Petroleum Co., Ltd., Calgary, is composed of a pad or blister which is welded on the outside surface of the casing over machine-drilled holes (Fig. 1). Into the pad is screwed an assembly containing two concentric, telescoping steel tubes. In the collapsed position the entire assembly extends ¾ in. out from the outside surface of the casing or 1 in. on tubing; in the maximum extended position the tube extends 2½ in. from the outer surface of the casing. Regardless of position, the assembly is flush with the inside surface of the

BY R. W. COBURN,
Vice President,
W. E. Stiles Engineering Co., Tulsa

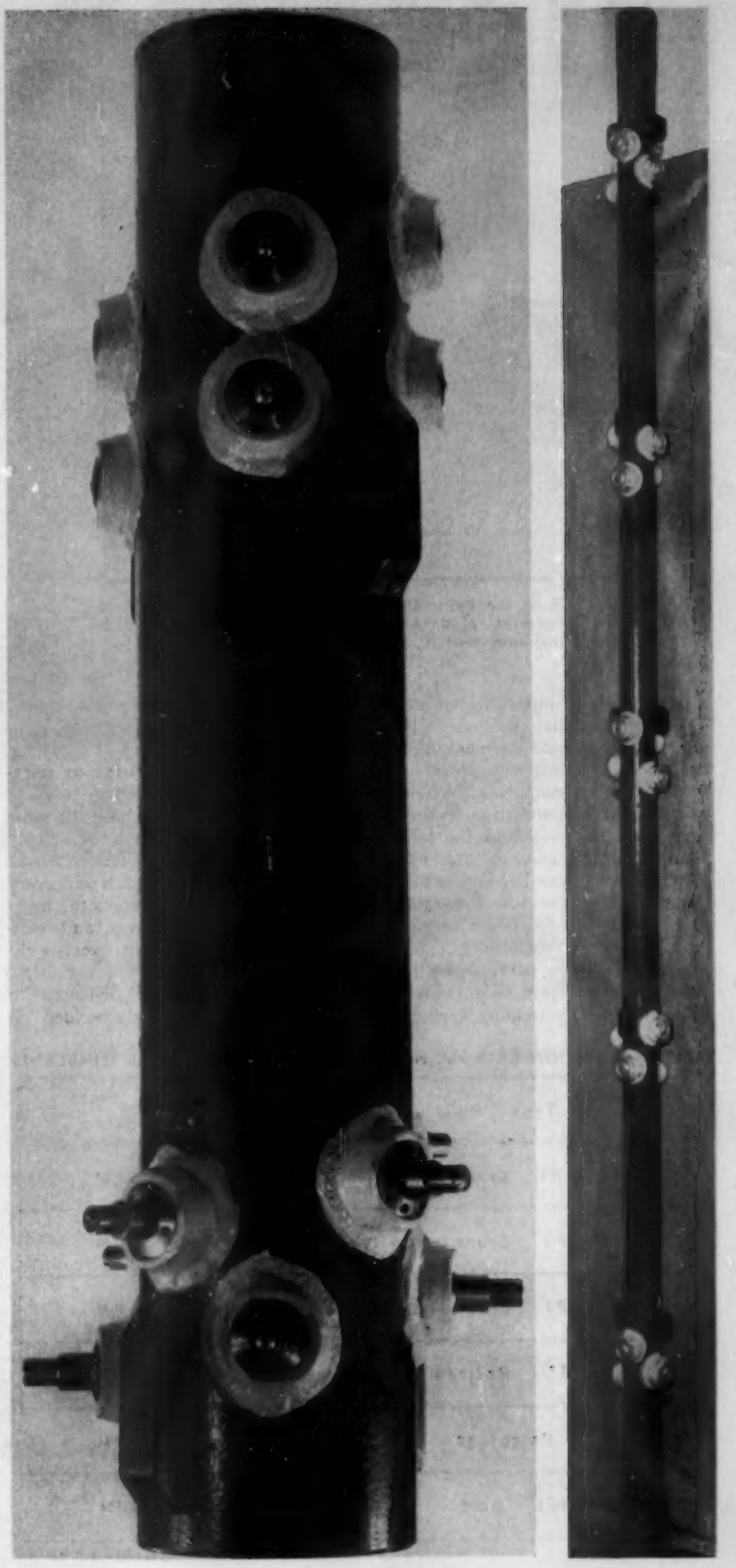
About the author . . .

R. W. Coburn is vice president and manager of field operations for W. E. Stiles Engineering, Tulsa. One of his specialties is well-completion work, and he has prepared several engineering articles on that subject. He was previously employed by Champlin Oil & Refining Co. for 5 years as district superintendent. Before that he was with Atlantic Refining Co. in various capacities, advancing to the position of assistant district superintendent. He is a 1943 graduate of the University of Tulsa in petroleum engineering.

pipe and will not interfere with cement plugs, packers, swabs or other tools normally run inside the pipe. Externally, 1-in. rudders protect and guide the Permeators.

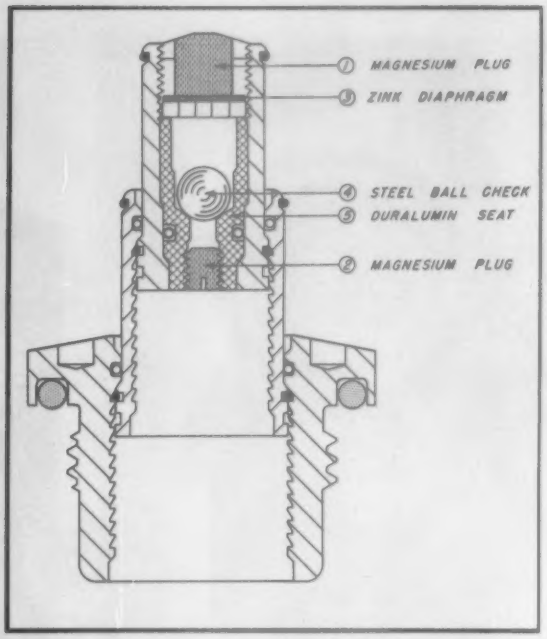
When running in, the Permeators are in the collapsed position, Fig. 1-A. With the pipe properly positioned opposite the pay zones and the cement displaced behind the casing, hydraulic pressure is applied to the interior of the casing forcing the telescoped tubes to extend outward through the still-fluid cement, to the face of the formation. When fully extended, each Permeator provides a steel pipeline ½ in. in diameter and 2½ in. long, Fig. 1-B. The standard model provides an opening of ½ in. but openings from a fraction of an inch to 1⅞ in. can be provided.

Cement damage unwanted . . . Previously published papers[1] [2] have shown that perforating techniques currently in use may result in damage to the cement bond between the casing and the formation. When the cement is shattered the perforations are pressure and fluid-connected. Fig. 2 illustrates the path of treated fluid and produced fluid in a case where cement has been shattered by perforating, and in the ideal case where the cement is intact. When the holes are inter-



THIS IS HOW Permeators look when installed on casing, at right. Note that the lower group is in the extended position. Fig. 3.

PERMEATORS can also be used on tubing, far right, for slim-hole completions. Fig. 4.



DETAILS of the Permeator in the extended position. Note the magnesium plugs which are dissolved with acetic acid. The duralumin seat is dissolved at a later time with HCl. Fig. 5.

connected it is impossible to stimulate each of the perforated holes selectively as is recommended in modern well-stimulation techniques.

Since the Permeators are extended by hydraulic pressure through the cement while it is still fluid, the cement is not disturbed while or after setting up. Each Permeator becomes a ½-in.-diameter steel flow line between the casing and the formation, and the cement bond is protected from acids and brines. With the cement bond intact there remains only the problem of selectively treating each hole. Since each perforation has a machined seat on the inside of the casing, positive mechanical sealing is effected when ball sealers are used to selectively stimulate the well.

Since all perforations have the same diameter, the "Injection Rate per Hole" theory[3] may be effectively used to assure treatment of each and every hole. Under these conditions the highest possible effectiveness and efficiency is obtained from every well-stimulation program.

The Permeators are delivered to the well location already welded on the casing. The standard pattern now being used on casing consists of a cluster of eight Permeators in a 2-ft. interval with a 16-in. blank interval between clusters, Fig. 3. When mounted on tubing the Permeators are placed in a cluster of four with a 20-in. blank interval between clusters, Fig. 4. Dummy Permeators may be used to blank off intervals not desired for production.

After the Permeators have been spaced on the casing string, the casing is run into the hole in the conventional manner. Scratchers and centralizers may be used if desired and the pipe may be rotated or reciprocated while displacing cement. Cementing is done by the two plug method.

After the top, or second, plug is inserted, a 10% solution of acetic acid is placed in the casing. A volume of acid sufficient to cover all of the Permeators is displaced into the casing: a third plug is used to separate the acid from the remaining volume of mud or water required to displace the cement.

When the second plug hits bottom, indicating that all of the cement has been displaced, the pressure in the casing is raised an additional 1,500 psi. and held for 10 minutes. This ruptures the protective diaphragm which is then dissolved by the acid. The hydraulic pressure forces all of the Permeator tubes to be extended to the face of the formation. Lock rings are incorporated in the Permeator to assure that when extended to any length the tubes cannot be forced back to a collapsed condition.

The component parts of the extended Permeator are shown in Fig. 5. The acetic acid dissolves the magnesium plugs (1 and 2) and the zinc diaphragm (3) in approximately 10 hours. The acid is then allowed to perform a low-pressure acid job on the formation immediately surrounding each hole. The well is under complete control during this operation because the steel ball (4) and duralumin seat (5) are not affected by acetic acid. They remain in place as an effective check valve. When the operator is ready to complete the well, hydrochloric acid is pumped through each Permeator. The duralumin seat is dissolved, leaving an unrestricted channel to the formation. A simplified Permeator, without the check-valve arrangement, has been developed for low-pressure tubing completions.

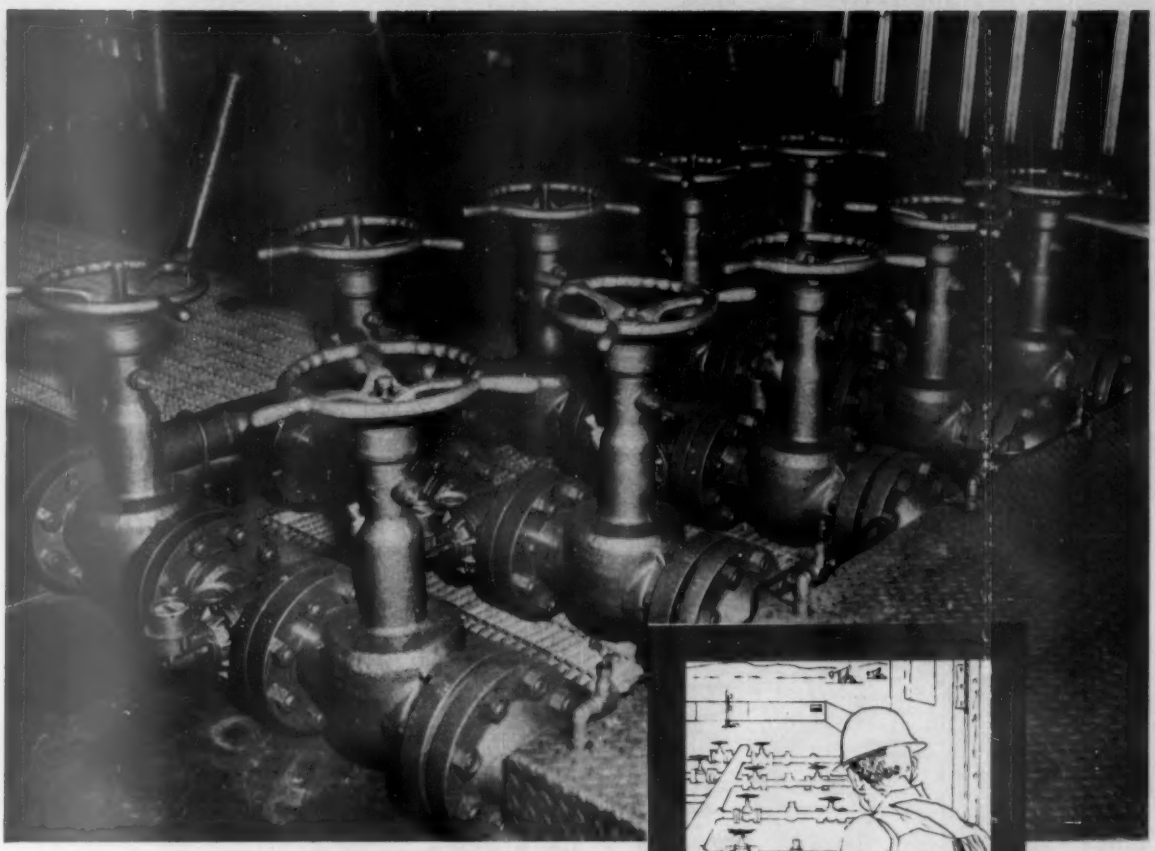
After the cement has set, the well is ready for production or stimulation.

Ball sealers used . . . The Injection

TABLE 1—INJECTION RATE PER HOLE VALUES FOR TYPICAL WELL STIMULANTS

Type Fluid	Injection Rate Per Hole
42° API Crude	4.0 BPM
42° API Crude – Gelled	3.4 BPM
38° API Crude	2.8 BPM
10° – 15° Refined Oil	2.5 BPM
Acid Petrofrac	2.0 BPM
15% HCL Acid	3.4 BPM

BPM = BARRELS PER MINUTE



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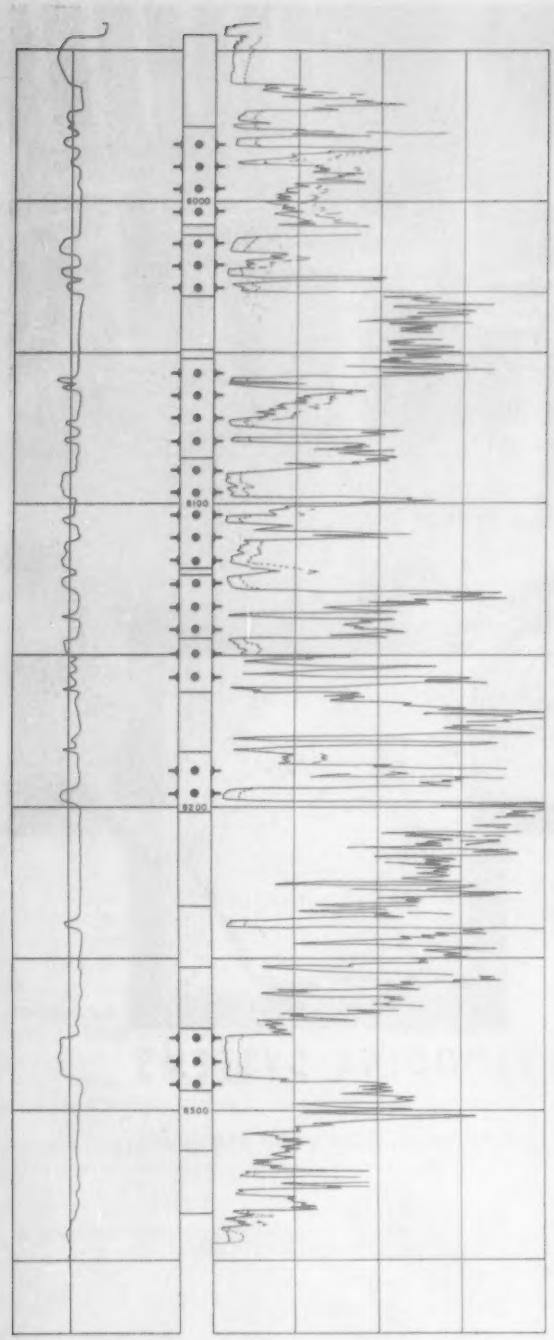
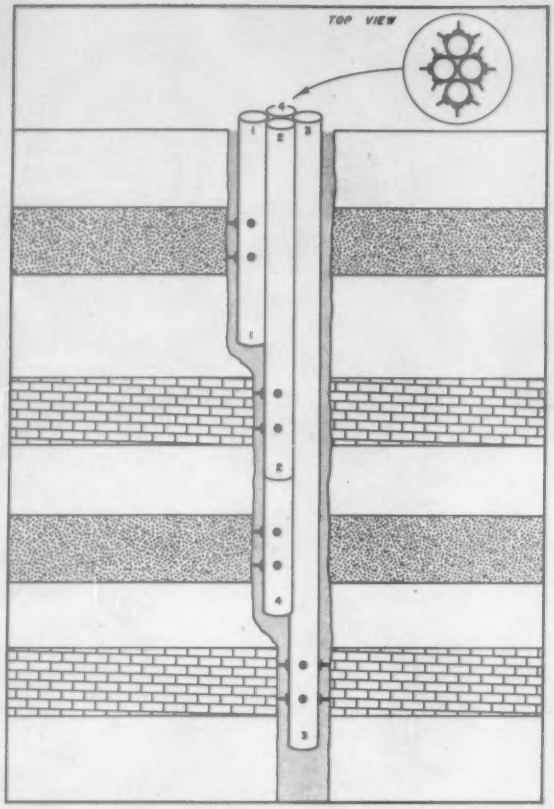


MICROLOG of Home Regent "A" Swan Hills 10-20, showing locations of Permeators. Fig. 6.



THIS IS HOW Permeators can be used in multitubingless completions. Special orienting equipment is not necessary as the Permeators are attached at the surface, and the danger of shooting across a second tubing string is eliminated. Fig. 7.

Rate per Hole theory of well stimulation using ball sealers is applied to selectively treat each hole. The known factors effecting treatment are:

- The number of perforations.
- The inside diameter of the perforations.
- The injection rate per hole for various fluids (Table 1). There remains only to select the number of stages and the number of ball sealers to be dropped per stage. These are calculated from the following formulas:

Number of stages equals the injection rate per hour from Table 1 times the number of perforations divided by the pump rate selected.

Number of ball sealers equals the pump rate selected divided by the injection rate per hole.

Field History

Permeators have been field-proven in 11 wells in the United States and Canada. In each case the casing was run to total depth and the Permeators were pumped out with no difficulty. The production history of each of the wells indicates that the Permeators functioned properly in all respects.

The largest job performed to date was on a National Petroleum Co. well in southern California. To open 1,286 ft. of pay zone at 7,000 ft., 3,468 Permeators were installed on 5½-in. casing. The smallest number of Permeators used was on a Home Oil Co. well in Alberta, Canada. To cover a 12-ft. section, 48 Permeators were installed and run to 9,200 ft.

The most recent use of the Permeator method has been by the Home Oil Co. of Canada in the Swan Hills area. In January 1959, 784 Permeators were run in the Home Regent "A" Swan Hills 10-20. Fig. 6 is a MicroLog of this well on which has been plotted Permeator locations.

The Home Oil Co. Regent "A" Swan Hills 4-19 was completed with 480 Permeators and was selectively treated in August 1959. This was the first application of selective treatment with ball sealers in Swan Hills. Despite the fact that this well had

less pay than other wells, and only 240 ball sealers were ejected (one-half enough), the production was greater than had been expected. As a result, the operators have planned to reenter the 10-20 well and selectively treat the 784 Permeators using the Injector Rate Per Hole theory.

Versatile tool . . . Available for all sizes of pipe from 2⅞ in. to 7 in., the Permeator is ideally suited for multitubingless completions. When used on any or all of the strings in the tubing bundle, the Permeator eliminates the necessity of providing special gun-orientation equipment and eliminates the danger of perforating one or more of the other tubing strings, Fig. 7.

Permeators are to be used by the Austrian Government and in the completion of a 10,000-ft. well in the Hassi-Messaoud area of the Sahara Desert.

New tools . . . Under development at present are two companion products that promise to further improve the effectiveness of the new completion procedure. One of these is a new plastic ball for the ball-sealer method of selective well treatment. This ball will be acid-resistant and will have a high impact strength.

The other product is a bottom-hole ball ejector. When perfected, this ejector will aid in the accurate placement of balls in the proper position for best results in well-treatment jobs.

Acknowledgments

The cooperation of the Home Oil Co. of Canada in making three of its wells available for Permeator completions is gratefully acknowledged. R. A. Brown, Jr., president; R. W. Campbell, general manager of production and pipelines; Bart Gillespie, vice president; Maurice Paulson, chief petroleum engineer; and Howard Wyckoff, drilling superintendent, were particularly helpful in carrying out the experimental program.

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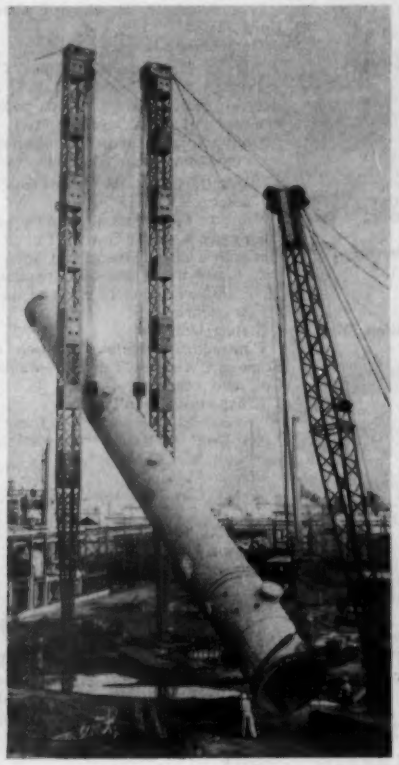
1. Stekoll, Marion, "Fracturing Through Perforations," The Oil and Gas Journal, October 29, 1956.

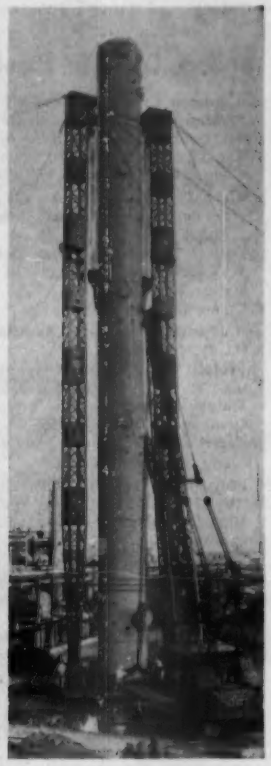
2. Coburn, R. W., "Custom-Designed Well Stimulation," The Oil and Gas Journal, March 4, 1957.

3. Coburn, R. W., "Engineered Completions Increase Oil Recovery," World Oil, October 1958.

There it lies . . .



there it goes . . .



. . . in position

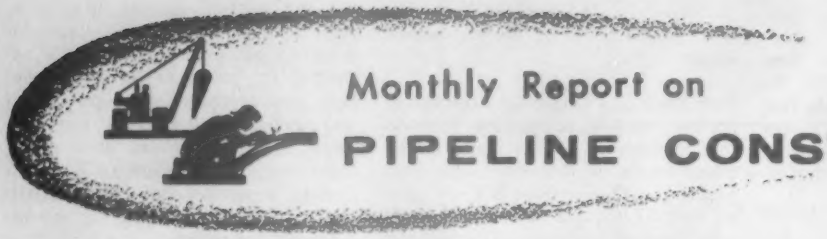
Tall tower gets on its feet in 75 minutes

THE FIRST SECTION of a two-tower high-purity propylene plant has been erected at Sun Oil Co.'s Marcus Hook, Pa., refinery.

The 145-ft. tower took 75 days to build, but only 75 minutes to install. It was designed by Sun Oil engineers, fabricated by Sun Shipbuilding & Dry Dock Co. and erected by Catalytic Construction Co.

The $2,000,000 plant will be used to furnish propylene for polymerization into polypropylene by Avisun Corp. This company, jointly owned by Sun and American Viscose Corp., will use modified polyethylene facilities at Koppers Co.'s Port Reading, Pa., plant for production of the polymer.

Polypropylene is the newest commercial member in the polymer field and is the lightest plastic now being produced. It has a wide range of potential uses in the plastic industry.



Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and construction contractors.

This summary report appears in the last issue of the Journal each month. New construction projects are reported weekly in Pipeline Briefs in the Journal's news section.

Projects are listed in three groups —U. S., Canadian, and Foreign— and according to type of line—crude, products, or natural gas.

U. S. Crude Oil Pipelines

- **Cameron Crude Oil Corp.**, Tulsa.
  Project: 10-mile 8-in. line from Lick Creek field in Union and Bradley counties, Arkansas, to Service Pipe Line station.
  Completion: November 1, 1959.
- **Cape Pipe Line Co.** (Sun Oil Co., Cities Service Co., Atlantic Refining Co.), Philadelphia.
  Project: Line from lower Delaware Bay to Philadelphia.
  Status: Planned.
  Completion: 1960.
- **Cooperative Refinery Association**, Kansas City, Mo.
  Project: 6 miles of 6-in. at Stockton, Kans.
  Status: Planned.
  Completion: Spring 1960.
- **Gillette Pipeline, Inc.**, and **A. W. Hartwig, Inc.**
  Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.
  Status: Pending Wyoming Public Service Commission approved.
- **Great Northern Railway Co.**
  Project: 400 to 600 miles of 12 to 20-in from Williston basin in Mont. and N. D., to Clearbrook or St. Paul, Minn.
  Contractor: **Pipe Line Technologists, Inc.**, Houston, has completed feasibility study.
- **Honolulu Oil Corp.** and six other companies.
  Project: 28-mile crude line connecting Fourbear, Pitchfork, and Spring Creek fields in Wyoming.
  Status: Pending approval of state public service commission.
- **Husky Oil Co.**, Cody, Wyo.
  Project: Gathering lines to the refinery at Cody.
  Status: Planned.
- **International Oil Pipeline Corp.**, New York City.
  Project: Would own U. S. section of 1,500-mile, 30-in. line proposed by Mid-Continent Pipe Lines, Ltd., from Edmonton, Alta., to Chicago. (See Canadian Crude-Oil Pipelines).
  Status: Proposed.
- **Mid-Continent Pipe Line Co.**, Tulsa.
  Project: 100 miles of 3, 4, and 6-in. gathering line and trunk line to connect Northeast Cherokee, Mendon, West Mendon, Eureka, and North Roundhill fields in northwestern Oklahoma.
  Status: Under way.
  Contractors: **Jess Whitlow**, Ponca City, Okla., has contract for the gathering line, and **A. C. Holder Construction Co., Inc.**, Tulsa, has contract for the main line.
  Completion: Nov. 1, 1959.
- **Ohio Oil Co.**, Findlay, Ohio.
  Project: 60 miles of 8-in. between Scipio field in Michigan and Buckeye Pipe Line Co.'s terminal south of Toledo, Ohio, and a 20-mile spur north into Pulaski and Albion fields.
  Status: Under way.
  Contractor: **O. R. Burden Construction Corp.**, Tulsa.
  Completion: January 1, 1960.
- **Service Pipe Line Co.**, Tulsa, Okla.
  Project: About 5 miles of 3, 4, and 6-in. line at North Sandy Bend pool, Union County, Arkansas.
  Contractor: **Snelling Co.**, Shreveport, La.
  Completion: Dec. 31, 1959.
- **Standard Oil Co. of California**, San Francisco.
  Project: Four lines to handle production from a platform 2.2 miles off coast of Summerland, Calif. Three of the lines will connect the platform and onshore tanks, and a 20-in. line will connect tanks to an offshore tanker mooring.
  Status: Under way.
  Contractor: **Morrison-Knudsen Co.**, San Francisco, Graver Tank & Manufacturing Co., and others.
  Completion: Jan. 1, 1960.
  Project: 22 miles of 8-in. from Swanson River Unit on Kenai Peninsula to Nikiski on Cook Inlet, Alaska.
  Status: Planned.
- **Texas Gas Transmission Corp.**, Owensboro, Ky.
  Project: 19½ miles of 3½-in. line off Louisiana coast.
  Status: Planned.

U. S. Products Pipelines

- **Badger Pipe Line Co.**, Bartlesville, Okla.
  Project: 2½-miles lateral from main Badger line to O'Hare Air Field in the Des Plaines, Ill., area near Chicago.
  Status: Under way.
  Completion: December 1959.
- **Continental Pipe Line Co.**, Ponca City, Okla.
  Project: 155 miles of 6-in. from Artesia, N.M, to El Paso, Tex.
  Status: Under way.
  Contractor: **R. H. Fulton & Co.**, Lubbock, Tex.
  Completion: Dec. 1, 1959.
- **Florida Pipeline & Storage Co.**, Uniontown, Pa.
  Project: 54 miles of 8-in. from Port Everglades to Homestead Air Force Base, Fla.
  Status: Under way.
  Contractor: **Ewin Engineering Corp.**, Washington, D.C., has engineering supervision contract.
  Completion: Nov. 1, 1959.
- **Humble Pipe Line Co.**, Houston, Tex.
  Project: 27 miles of 10-in. from Baytown to Houston.
  Status: Under way.
  Completion: December 31, 1959.
- **Husky Oil Co.**, Cody, Wyo.
  Project: Line from Cody to the Yellowstone products line west from Billings, Mont.
  Status: Planned.
- **Kaneb Pipe Line Co.**, Houston.
  Project: 111 miles of 6-in. from Phillipsburg, Kans., to Fairmont terminal near Geneva, Neb., and 168 miles of 6-in. from Fairmont to Yankton, S.D.
  Status: Under way.
  Contractor: **Williams Brothers Co.**, Tulsa.
  Completion: Fall 1959.
- **Missouri-Kansas-Texas Railroad.**
  Project: 1,400 miles of LPG line from West Texas to the upper Midwest. The line would originate between Midland and the New Mexico border and would fork at McPherson, Kans. One branch would go to the Minneapolis area, and the other to the Madison, Wis., area.
  Status: Proposed.
- **Wabash Pipe Line Co.**, Findlay, Ohio.
  Project: 29 miles of 12-in. and 9 miles of 16-in. from Griffith, Ind., to Lake Calumet, Chicago, Ill.
  Status: Under way.
  Contractors: **Morrison Construction Co.**, Hammond, Ind., and **Contracting & Material Co.**, Evanston, Ill.

U. S. Natural Gas Pipelines

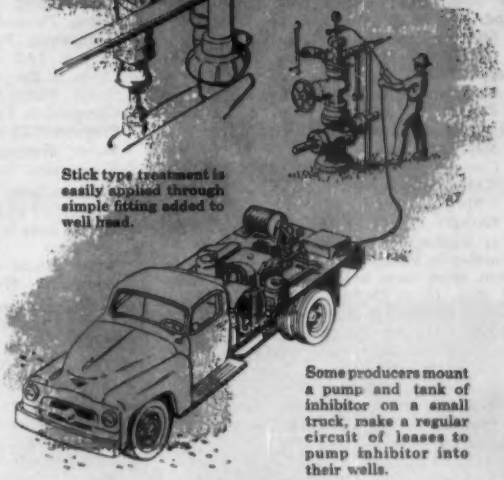
- **Algonquin Gas Transmission Co.**, Boston, Mass.
  Project: 6 miles of 20-in. from Mendon to Wrentham, Mass.
  Status: Planned.
  Contractor: **Construction Service Co.**, Bound Brook, N. J.
  Completion: Before winter.
  Project: 3 miles of 8-in. in Freetown, Mass.
  Status: Planned.
  Completion: Before winter.
- **Arkansas Industrial Pipeline Corp.** (Arkansas Louisiana Gas Co.), Shreveport, La.
  Project: 130 miles of 18-in. from Perla to Helena, Ark.
  Status: Planned.
  Completion: 1960.
- **Arkansas Louisiana Gas Co.**, Shreveport, La.
  Project: 3 miles of 2-in., 58.5 miles of 4-in., and 2 miles of 6-in. gathering line.
  Status: Planned in 1959.
  Project: 77.4 miles of 6-in. transmission lines.
  Status: Planned in 1959.
- **Atlantic Seaboard Corp.**, Charleston, W. Va.
  Project: 19.8 miles of 26-in. loops in West Virginia and Virginia.
  Status: Under way.
  Contractor: **Gentry, Kaighen, & Hughes.**
  Completion: November 1959.
- **Central Hudson Gas & Electric Corp.**, Poughkeepsie, N. Y.

Facts ON Visco® CORROSION PREVENTION

Here are facts on Visco Corrosion Inhibitor costs in a wide variety of producing oil and gas wells—probably some near you . . . or with corrosion problems like yours. At every well, Visco treatment is only a small fraction of the cost of corrosion damage in untreated wells.

WELL TYPE	WELL LOCATION	DAILY PRODUCTION Oil bbls	Water bbls	Gas MCF	Frequency of Visco Treatment	Cost of Visco Treatment per bbl of produced fluid
Pumping	East Texas	40	300	—	3 times a week	.13¢
Pumping	Eastern Kansas	2	492	—	Once a week	.03¢
Flowing	West Texas	20	6.3	—	Twice a week	.22¢
Pumping	Northern Kansas	10	70	—	Once a day	.62¢
Gas Lift	West Texas	20	20	—	Once a day	2.8¢
Pumping	North Texas	—	2000	—	Once a day	.16¢
Pumping	Eastern Kansas	—	250	—	Twice a week	.11¢
Flowing	East Texas	51	155	1	Once a day	.28¢
Flowing	West Texas	420	—	—	Twice a week	.13¢
Gas	East Texas	25	Trace	22.9	Twice a week	4.6¢*
Pumping	West Texas	420	210	—	Every other day	.14¢
Pumping	West Texas	441	441	—	Every other day	.052¢
Gas	Northern La.	—	—	23.4	Once a day	2.42¢*
Pumping	Eastern Kansas	—	250	—	Once a day	.15¢
Pumping	Kansas	100	948	—	Twice a week	.13¢
Gas	Louisiana	9.2	Trace	300	2 Sticks every other day	.66¢*
Pumping	East Texas	46	176	0.92	Once a day	.27¢
Pumping	East Texas	51	155	1.0	Once a day	.28¢
Pumping	East Texas	20	400	—	Three times a week	.12¢
Pumping	Eastern Kansas	2.5	276	—	Once a week	.09¢

*Cost in cents per million cubic feet.



Stick type treatment is easily applied through simple fitting added to well head.

Some producers mount a pump and tank of inhibitor on a small truck, make a regular circuit of leases to pump inhibitor into their wells.

For fast action on a sound, money-saving approach to your downhole corrosion problems, call Houston, JAckson 8-2495, or contact your Visco Field Service Man.

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Visco . . . CONSISTENTLY EFFICIENT OIL INDUSTRY CHEMICALS

PIPELINE CONSTRUCTION

Project: 13 miles of 10-in. from Highland to Kingston (Part II), N. Y.
Status: Planned.
Completion: 1960.
Project: 3.4 miles of 8 and 6-in. from Fishkill to Frinkerhoff.
Status: Under way.
Contractor: **C. N. Flagg & Co., Inc.**, South Meriden, Conn.
Completion: November 1959.

• **Chicago District Pipeline Co.**
Project: 50 miles of 36-in. from Joliet to Chicago.
Status: Under way.
Contractor: **Contracting & Material Co., Evanston, Ill.**
Completion: Fall 1959.

• **Coastal States Gas Producing Co.**, Corpus Christi, Tex.
Project: 49 miles of 18-in. and 55 miles of 20-in. from Kelsey Base (Brooks) to Rodriguez field, La Salle County, Texas.
Status: Planned.
Contractor: **O. R. Barden Construction Corp., Tulsa.**
Completion: Dec. 1, 1959.
Project: 60 miles of 10-in. in La Salle and Frio counties, Texas.
Status: Planned.
Completion: June 1960.

• **Colorado Interstate Gas Co.**, Colorado Springs, Colo.
Project: 109 miles of 26-in. from Four-Way station in Tex. Panhandle, to Morton Junction in southeastern Colo.; 135 miles of 34-in. from there to Pueblo, and 100 miles of 30-in. on to Denver; 148 miles of 34-in. from CIG line at Rock Springs, Wyo., to Provo, Utah, to connect with proposed El Paso Natural aGs Co.'s line to Calif.
Status: Planned.
Completion: January 1, 1961.

• **Colorado Oil & Gas Corp.**, Denver.
Project: 402-mile line from Gubik field to Fairbanks, Alaska.
Status: Proposed.

• **Columbia Gulf Transmission Co.**, Houston.
Project: 11 miles supply line connecting Black 17 field, East Cameron area, La.
Status: Approved.
Project: 10 miles of 12-in. supply loop to Erath field, Vermilion Parish, La., and 9 miles of various-size field lines in Acadia and Vermilion parishes, La.
Status: Approved.
Project: 10 miles of 20-in. loop in Jefferson Davis and Vermilion parishes, La., and 3 miles of 6-in. loop in Cameron Parish, La.
Status: Approved.
Project: 41 miles of 24-in. loop of east lateral in vicinity of Rayne, La.
Status: Approved by FPC.
Completion: Fall 1959.

• **Consumers Power Co.**, Jackson, Mich.
Project: 120 miles of 26-in. from Mich.-Ind. border connection with Trunkline Gas Co., to Plymouth, Mich., and 20 miles of 24-in. from Northville to Clarkston, Mich.
Status: Under way.
Contractor: **Cape Construction Co., Inc.**, Cape Girardeau, Mo.
Completion: 1960.

• **East Ohio Gas Co.**, Cleveland.
Project: 75 miles of 18-in. in Harrison, Mahoning, Columbiana, Carroll, and Belmont counties, Ohio.
Status: Under way.
Contractor: **Sharman, Allen, Gay & Taylor, Inc.**, Houston.

• **El Paso Natural Gas Co.**, El Paso, Tex.
Project: 34.2 miles of 20-in. from Puckett, Tex., to Goldsmith plant; 51.3 miles of 20-in. from Terrell to Puckett Plant discharge; and 23 miles of 20-in. from Goldsmith to Eunice-Dumas line.
Completion: January 1960.
Project: 244 miles of 30-in. Permian-San Juan Line loops.
Completion: January 1960.
Project: 87 miles of gathering lines in Bisti field in San Juan Co., N. M.
Status: Has temporary FPC approval.
Project: 62-mile gathering system of 4½-10-in. in Beaver County, Okla.
Status: Pending FPC approval.
Completion: Fall 1959.
Project: 395 miles of 34-in. from Salt Lake City, to Calif. border near Las Vegas, Nev.
Status: Pending FPC approval.
Completion: January 1, 1961.
Project: 14 miles of 16-in. to deliver gas to the Ocotillo steam-electric generating plant near Phoenix, Ariz.
Status: Temporarily approved by FPC.

• **Equitable Gas Co.**, Pittsburgh.
Project: 15.3 miles of 16-in., 3 miles of 20-in. in W. Va. and Pa.
Status: Planned.
Completion: Fall 1960.
Project: 14.7 miles of 16-in., 5.9 miles of 20-in. in Pa.
Status: Planned.
Completion: Fall 1961.
Project: 17.25 miles of 20-in. in Pa.
Status: Planned.
Completion: Fall 1962.

• **Gulf Refining Co.**, Houston.
Project: 17 miles of 4, 6, 8, 10, and 12-in. gathering lines in Puckett field, Pecos County, Texas.
Status: Under way.
Contractor: **Houston Contracting Co.**

• **Gulf Resources, Inc.**, New York.
Project: 136 miles of 14 and 20-in. from Hidalgo County to LaSalle County, Texas.
Status: Pending FPC approval.

• **Hope Natural Gas Co.**, Clarksburg, W. Va.
Project: 20 miles of 24-in. line in Wetzel and Monongalia counties, W. Va., replacing two 16-in. lines.
Status: Approved.
Project: 45-mile line from W. Va. to Pittsburgh area.
Completion: Fall 1959.

• **Iron Ranges Natural Gas Co.**, St. Paul.
Project: 79 miles of 10 and 12-in. from Grand Rapids to Hoyt Lake, Minn., and 67 miles of 12-in. from Duluth to Silver Bay, Minn.
Status: Approved by FPC.
Completion: 1960.

• **Iroquois Gas Co.**
Project: 9.5 miles of 16-in. in Erie County, N. Y.
Status: Pending FPC approval.

• **Kansas-Nebraska Natural Gas Co., Inc.**, Phillipsburg, Kans.
Project: 4 miles of 8-in. from Atwood, Colo., to Sterling.
Completion: Oct. 30, 1959.

• **Laclede Gas Co.**, St. Louis, Mo.
Project: 107 miles of 24-in. between Hallsville, Mo., and St. Louis.
Status: Proposed.

• **Lone Star Gas Co.**, Dallas.
Project: About 7 miles of 10-in. lateral from North Doyle dehydration plant in Stephens County, Oklahoma, to Carter-Knox field, Grady County.
Status: Approved by FPC.

• **Lone Star Gas Co.** and **Coastal States Gas Producing Co.**
Project: 37 miles of gathering line in North Texas.
Status: Planned.

• **Manufacturers Light & Heat Co.**
Project: 61 miles of 20-in. (to replace 135 miles of old 6-in.).
Status: Under way.
Contractor: **Harford Bros.**, Emporium, Pa.
Completion: Fall 1959.

• **Michigan Wisconsin Pipe Line Co.**, Detroit.
Project: 134.4 miles of 24-in., 27.9 miles of 20-in., 96.3 miles of 16-in., and 118 miles of smaller diameter lines, in Wisconsin and Michigan.
Status: Pending FPC approval.
Completion: 1960.

• **Midwestern Gas Transmission Co.**, Houston.
Project: 504 miles of 24-in. from Emerson, Man., to Marshfield, Wis., plus 54 miles of sales laterals.
Status: Pending FPC approval.
Completion: 1960.

• **Mississippi River Transmission Corp.** (Mississippi River Fuel Corp.), St. Louis.
Project: 115 miles of 24-in. from near Oran in southeast Mo., north between Ste. Genevieve and Bonne Terre into vicinity of Herculaneum and Pevely then into St. Louis Co.
Status: Planned.
Completion: Last half 1960.

• **Natural Gas Pipeline Co. of America**, Chicago.
Project: 29 miles of 12-in. lateral from Enville and Southwest Enville fields, Love County, Oklahoma.
Status: Planned.
Completion: Tentatively Dec. 31, 1959.
Project: 16 miles of 3, 4, and 6-in. gathering system laterals in Jack and Wise counties, Texas.
Status: Planned.
Completion: Dec. 31, 1959.

• **New York State Natural Gas Corp.**, Pittsburgh.
Project: 14.5 miles of 26-in. from Chatham Township to Lawrenceville, Pa.
Status: Planned.
Completion: 1959.

• **Niagara Mohawk Power Corp.**, Syracuse, N. Y.
Project: 104 miles of 12-in. from Watertown, N. Y., to Massena, N. Y.
Status: Pending FPC approval.
Contractor: **Fulghum Contracting Corp.**, Harrisburg, Pa.

• **Northern Illinois Gas Co.**
Project: 140 miles of 22-in. from Des Plaines to East Dubuque, Ill.
Status: Under way.
Contractor: **Contracting & Material Co.**, Evanston, Ill.

• **Northern Natural Gas Co.**, Omaha, Neb.
Project: 217 miles of main line, 221 miles of main-line loops, and 2,178 miles of branch lines of various diameters.
Status: Approved by FPC.
Completion: 1959-60.
Contractors: **R. H. Fulton & Co.**, Lubbock, Tex., and **Curran & Co.**, Great Falls, Mont. have contract for 55 miles of 16-in. from North Branch to St. Cloud, Minn., and **Williams Brothers Co.**, Tulsa, has contract for 57 miles of 10 and 12-in. from Brainerd to St. Cloud, Minn.
Project: 72 miles of 24-in. and 98.8 miles of 20-in. in Minnesota.
Contractors: **R. H. Fulton & Co.**, Lubbock, Tex.; **Curran & Co.**, Great Falls, Mont.; and **Williams Brothers**, Tulsa.
Project: 36.5 miles of 2 to 16-in. gathering lines at Otis gas field, Kansas, for underground storage, and 36.7 miles of 30-in. transmission line connecting Otis storage area to main line at Bushton, Kans.
Status: Pending FPC approval.
Project: 188 miles of 24-in. and 215 miles of 30-in. from Farmington, Minn., to International border.
Project: 8 miles of 30-in. main line loop north of Ventura, Iowa, and 22 miles of branch lines near Marshalltown and Griswold, Iowa.
Status: Approved by FPC.

(Continued on page 111)

COMPRESSOR QUIZ

Take this 5 minute quiz and check your knowledge of balanced opposed compressors.... ANSWERS ON NEXT PAGE. NO PEEKING!

1. What is the reason for an outboard bearing supported motor?

- ☐ Accessibility
- ☐ Shaft alignment
- ☐ Weight saving

2. Which design provides the smallest force couples?

- ☐ Bearing between the crank throws
- ☐ No bearing between the crank throws
- ☐ Both are equal

3. Structurally, what's the critical point in the multi-crank horizontal compressor from a design viewpoint?

- ☐ Lateral forces in the frame
- ☐ Vertical forces in the frame
- ☐ Cylinders

4. What type of motor is usually used on a balanced opposed compressor?

- ☐ Induction
- ☐ Engine-type synchronous
- ☐ Wound rotor

5. Can machine-mounted coolers and interstage piping be factory pre-fitted?

- ☐ Yes
- ☐ No
- ☐ Only on simple arrangements

6. Why is the balanced opposed compressor easier to install than other types of equivalent size?

- ☐ Lighter weight
- ☐ Less parts
- ☐ Semi-packaged design

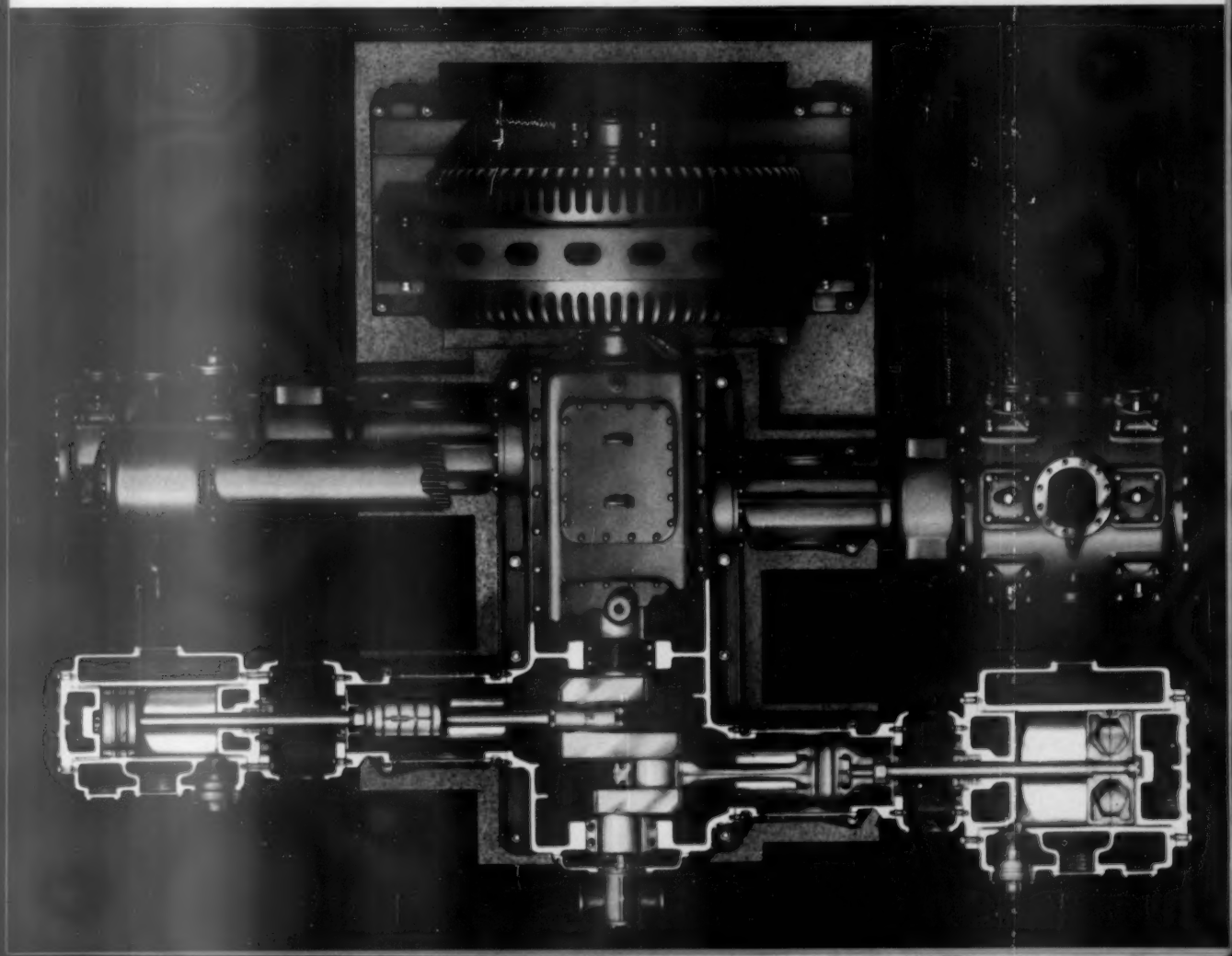
7. Is it common practice to install more than one compressor service on a single multi-cylinder frame?

- ☐ Yes
- ☐ No

8. Industry's most preferred compressor valve is standard with Worthington. It is:

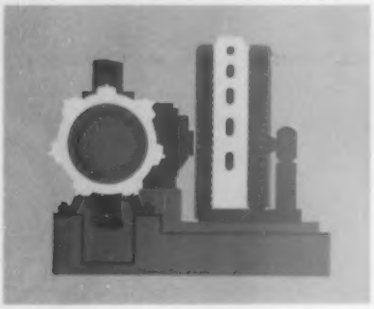
- ☐ A plate valve
- ☐ A spring activated valve
- ☐ A Feather Valve

WORTHINGTON



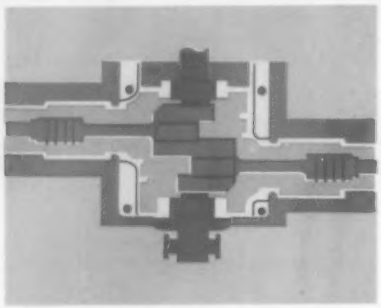
ANSWERS

to key compressor questions on previous page



1. What is the reason for an outboard bearing supported motor?

Ans: Shaft alignment. Secure and permanent support of the large synchronous motor rotor is best obtained by placing a bearing on each side of the rotor.



2. Which design provides the smallest force couples?

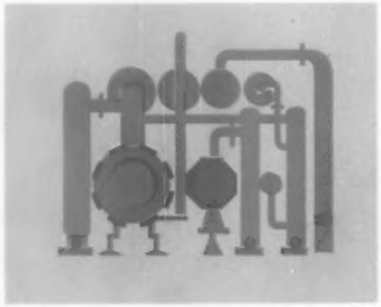
Ans: No bearing between the throws. Worthington's adjacent crank design reduces couple arm to a minimum.

3. Structurally, what's the critical point in the multi-crank horizontal compressor from a design viewpoint?

Ans: Lateral forces in the frame which tend to distort the frame. Worthington's precision machined and fitted tie bars give solid support to the frame, preventing misalignment due to distortion.

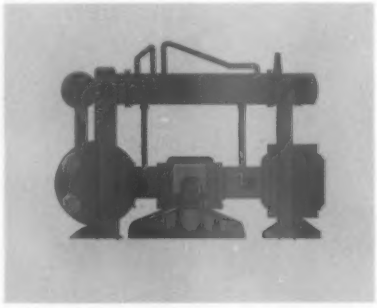
4. What type of motor is usually used on a balanced opposed compressor?

Ans: Engine-type synchronous is the major application; but complete flexibility of Worthington design permits use of any type driver, including turbine and gear or power engine.



5. Can machine mounted coolers and interstage piping be factory pre-fitted?

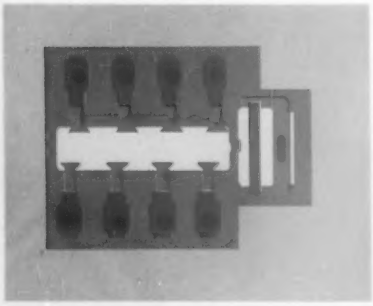
Ans: Yes. In fact, when overhead mounted piping and coolers are furnished by Worthington, such piping and coolers are always completely assembled and fitted to the compressor before it leaves the factory.



6. Why is the balanced opposed compressor easier to install than other types of equivalent size?

Ans: Semi-packaged design. Self aligning features permit easy and sure crankshaft, frame, and motor alignment on simplified foundation. Pre-fitted coolers and piping eliminate many problems associated with multi-stage compressor installation.

SCORING: If you got 7 or 8 questions right you're up-to-date on balanced opposed compressors and you recognize the value of the Worthington machine. If you got 5 or 6 right you're acquainted with some of the benefits of Worthington equipment, but you need brushing up. If you got less than 5 right, get in touch with your nearest Worthington technical representative. He'll give you the full story on the many advantages of the Worthington design. Worthington Corporation, Harrison, N. J. In Canada: Worthington (Canada) Ltd., Brantford, Ont. 36.5



7. Is it common practice to install more than one compressor service on a single multi-cylinder frame?

Ans: Yes. Particularly where the compression services are related, as in chemical plants. The arrangement results in substantial savings in initial plant cost.

8. Industry's most preferred compressor valve is standard with Worthington. It is:

Ans: Feather Valve! By actual count of 2 to 1, this outstanding compressor valve is preferred by operators and engineers.

WORTHINGTON

PIPELINE CONSTRUCTION

• **Ohio Fuel Gas Co.,** Columbus, Ohio.
Project: About 30 miles of 18 through 24-in. in various locations in Ohio.
Contractor: **Shamrock Construction Co.,** Lansing, Mich.

• **Oklahoma Natural Gas Co.,** Tulsa.
Project: 10½ miles of 8-in. in Grady County, Oklahoma.
Status: Under way.
Contractor: **Pipeline Service Co.,** Seminole, Okla.
Completion: Nov. 1, 1959.

• **Pacific Gas & Electric Co.,** San Francisco.
Project: 120 miles of 34-in. looping of Topock-Milpitas main line.
Status: Planned. Pending FPC approval.
Completion: 1960-61.
Project: 42 miles of 30-in. from Pittsburg to Irvington, Calif.
Status: Planned.
Completion: 11 miles in 1959; 31 miles in 1960.
Project: 296 miles of 36-in. from Klammath Falls, Ore., to Antioch, Calif.
Status: Pending Canadian export permit and FPC approval.
Completion: 1961.

• **Pacific Gas Transmission Co.** (Pacific Gas & Electric, San Francisco).
Project: 614 miles of 36-in. from Kingsgate, B. C., to California border near Klammath Falls, Ore.
Status: Pending approval of FPC and Canadian authorities to import gas. To start late 1959.

• **Pacific Lighting Gas Supply Co.,** Los Angeles.
Project: 116 miles of 34-in. from Needles to Newberry, Calif.
Status: Planned.
Completion: June 1, 1960.

• **Pacific Northwest Pipeline Corp.,** Salt Lake City.
Project: 17 miles of 30-in. loop of Spokane-Coeur d'Alene lateral.
Status: Pending FPC approval.
Completion: 1961.
Project: 59 miles of 16 and 20-in. lateral line from a point on main line near Vancouver, Wash., to Salem, Ore.
Status: Pending FPC approval.
Project: About 5½ miles of 3 and 4-in. gathering line at Piceance Creek, Colo.
Status: Under way.
Completion: Nov. 30, 1959.

• **Panhandle Eastern Pipe Line Co.,** Kansas City.
Project: 3 miles of 4-in. lateral line, and 30 miles of 4-in., 4 miles of 6-in., and 4 miles of 8-in., gathering line.
Contractor: **Hall Construction Co.**
Completion: Dec. 31, 1959.
Project: 22 miles of 4-in., 7 miles of 6-in., and 8 miles of 8-in. gathering lines.
Status: Planned.

• **Pennsylvania Gas Co.,** Warren, Pa.
Project: 23 miles of 10-in. in Erie Co., Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pa.; 30 miles of branch lines, and several small distribution lines.
Status: Approved.

• **Permian Basin Pipeline Co.,** Omaha, Neb.
Project: 83 miles of 16-in. from the Pioneer gathering line in Schleicher County, Tex., to Spraberry, Tex.
Status: Pending FPC approval.
Completion: Fall 1959.

• **Phillips Petroleum Co.,** Bartlesville, Okla.
Project: 37 miles of 3 to 8-in. gathering lines in Lea and Eddy counties, New Mexico.
Status: Under way.
Contractor: **Lasley Construction Co.,** Hobbs, N. M.
Completion: Dec. 1, 1959.

• **Piedmont Gas Co.,** Hickory, N. C.
Project: 78 miles of 2 to 8-in. extension off Transcontinental in N. C., to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.
Status: Approved.

• **Pioneer Natural Gas Co.,** Amarillo, Tex.
Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.
Status: Pending FPC approval.
Project: 12 miles of 10-in. from Muleshoe, Tex., northward.
Status: Pending FPC approval.

• **Public Service Co. of North Carolina,** Gastonia, N. C.
Project: About 47 miles of 4, 8, and 10-in. in North Carolina.
Status: Bids were scheduled early in October.

• **Richfield Oil Corp.,** Los Angeles.
Project: 60 miles of 20-in. from Cuyama Valley to Ventura, Calif.
Status: Under way.
Contractor: **Alex Robertson Co.,** Paramount, Calif.
Completion: Fall 1959.

• **Rio Gas Gathering Co.,** San Antonio, Tex.
Project: 97 miles of 3 to 8-in. gathering line in Hidalgo County, Tex.
Status: Pending FPC approval.
Completion: 1959.

• **Shamrock Oil & Gas Corp.,** Amarillo, Tex.
Project: 49 miles of 20-in. from Dumas to Amarillo.
Status: Planned.
Completion: Early 1960.

• **Signal Oil & Gas Co.,** Los Angeles.
Project: Extension of gathering system from Tioga, N. D., to near the Canadian border in Burke Co.
Status: Proposed.

• **South Texas Natural Gas Gathering Co.** (Coastal States Gas Producing Co., Corpus Christi, Tex.)
Project: A 60-mile line from existing system to steam generating plant in Pearsall County, Tex.
Completion: January 1960.
Project: 125 miles of 8, 10, 14, 18, and 20-in. line in Jim Hogg County, Texas.
Status: Under way.
Contractor: **O. R. Burden Construction Corp.,** Tulsa.

• **Southern California Gas Co.,** Los Angeles.
Project: 106 miles of 36-in. and 11 miles of 34-in. from Newberry, Calif., to Placentia.
Status: Proposed.
Completion: January 1, 1961.
Project: 91 miles of 34-in. from Newberry, Calif., to Ivanpah Lake.
Status: Proposed.
Completion: January 1, 1962.
Project: 3 miles of 34-in. in Sullivan Canyon northerly from San Vicente Boulevard, Los Angeles.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.,** San Francisco, Calif.
Completion: December 1959.
Project: 10 miles of 34-in. from Western terminal to Burbank line.
Status: Proposed.
Completion: December 1961.

• **Southern Counties Gas Co.,** Los Angeles, Calif.
Project: 14 miles from Moreno to Perris, Riverside County, California.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**
Completion: November 1, 1959.

• **Southern Natural Gas Co.,** Birmingham, Ala.
Project: 34 miles of 24-in. from Enterprise, Miss., to Elmore, Ala.
Status: Under way.
Contractor: **C. S. LeNoir Construction Co.,** Austin, Tex.
Completion: November 1, 1959.
Project: 10.5 miles of 24-in. from Enterprise, Miss., to Gwinville, Miss.
Status: Under way.
Contractor: **Oklahoma Contracting Co.,** Dallas, Tex.
Completion: November 1, 1959.
Project: 79 miles of 18-in. from Gwinville, Miss., to Cranfield, Miss.
Status: Under way.
Contractor: **Oklahoma Contracting Co.,** Dallas.
Completion: November 24, 1959.
Project: About 66 miles of 20-in. from Elmore, Ala., to Macon, Ga.
Status: Under way.
Contractor: **Harbert Construction Co.,** Birmingham.
Completion: November 1, 1959.
Project: 22 miles of 14-in. from Macon, Ga., to Atlanta.
Status: Under way.
Contractor: **Harbert Construction Co.,** Birmingham.
Completion: November 1, 1959.
Project: 79 miles of 16-in. from Macon, Ga., to Wrens, Ga.
Status: Under way.
Contractor: **Buchanan Contracting Co.,** Birmingham.
Completion: November 1, 1959.

• **Spur Oil Co.,** Houston.
Project: 12-mile system in Hull, Tex. field.

• **Tennessee Gas Pipeline Co.**
Project: 70 miles of 30-in. from Portland, Tenn., to Glasgow, Ky.
Status: Under way.
Contractor: **Williams Brothers Co.,** Tulsa.
Completion: Fall 1959.
Project: 72 miles of 30-in. in Kentucky.
Status: Under way.
Contractor: **Western Pipe Line, Inc.,** Austin, Tex.
Completion: Fall 1959.
Project: About 30 miles of 30-in. in Kentucky and 28 miles of 26-in. in Kentucky and West Virginia.
Status: Under way.
Contractor: **H. C. Price Co.,** Bartlesville, Okla.
Completion: Fall 1959.
Project: 21 miles of 16-in. gathering line from Louisiana coast to Block 46 in the Vermilion area.
Status: Pending FPC approval.
Project: 2 miles of 12-in. gathering line from Block 66 to Block 64, East Cameron area, offshore Louisiana.
Status: Pending FPC approval.
Project: 158 miles of 36-in. gas loop at various points between Kinder, La., and Centerville, Tenn.
Status: Approved by FPC.
Project: 41 miles of 30-in. loop east of Hamburg, N. Y.
Status: Pending FPC approval.
Project: 25 miles of 30-in. loop near Kane, Pa.
Status: Pending FPC approval.

• **Tensas Gas Gathering Corp.**
Project: 37 miles of 2 to 8-in. from Rodney field, Miss., westerly to connect with Olin Gas Transmission Co., line in Tensas Parish, La.
Status: Approved.

• **Texas Eastern Transmission Corp.,** Shreveport, La.
Project: 22 miles of 14-in. from Rayne field, La., to Opelousas.
Status: Under way.
Project: 81 miles of 24-in. from Tamarack, Pa., to Perulack, Pa.
Status: Pending FPC approval.
Project: 40 miles of 36-in. from Lambertville, N. J., to Linden, N. J.
Status: Pending FPC approval.

PIPELINE CONSTRUCTION

Project: 23 miles of 20-in. from Eagle, Pa., to Chester Junction, Pa.
Status: Pending FPC approval.
Project: 4 miles of 30-in. from Linden, N. J., to Staten Island, N. J.
Status: Pending FPC approval.
Project: 65 miles of 30-in. from Perulack, Pa., to Lambertville, N. J.
Status: Pending FPC approval.

• **Texas Electric Service Co.**, Fort Worth, Tex.
Project: 290-mile 22 or 24-in. line from Old Ocean field, Brazoria County, Texas, to Fort Worth, and 70-mile 16-in. line from there to Graham, Tex.
Status: Planned.
Completion: Fall of 1960.

• **Texas Gas Transmission Corp.**, Owensboro, Ky.
Project: 74 miles of 30-in. line in Central and North Louisiana.
Status: Under way.
Contractor: **Houston Contracting Co.**
Completion: Nov. 1, 1959.
Project: About 164 miles of 30-in. in Kentucky, Tennessee, Louisiana, Arkansas, and Mississippi.
Status: Under way.
Contractor: **Western Pipe Line, Inc.**, Austin, Tex., has contract for 93 miles of this project.
Project: 81.7 miles of 26-in. in Kentucky, Indiana, and Ohio, and 6.9 miles of 12-in. near Dixie, Ky.
Status: Under way.
Contractor: **Western Pipe Line, Inc.**, Austin, has contract for the 26-in. line.
Project: 93 miles of supply lines in Louisiana and adjacent offshore areas.
Status: Under way.
Contractor: **Houston Contracting Co.** has contract for 32 miles of 12-in. from South Roanoke gas field to Grand Cheniere, La.

• **Texas Illinois Natural Gas Pipeline Co.**, Chicago.
Project: 371 miles of 30-in. loop of present system between Texas and Chicago.
Status: Pending FPC approval.
Completion: 1960.
Project: 10.6 miles of 8-in. line in Starr and Hidalgo counties, Texas.
Status: Pending FPC approval.

• **Transcontinental Gas Pipe Line Corp.**, Houston, Tex.
Project: 36-in. loops on the 1,800-mile system from Texas to New York. This would be the beginning of a third complete line.
Status: Planned.
Project: 29 miles of 20-in. in La Salle County, Texas.
Status: Approved by FPC. Bids were scheduled in October.
Project: 38 miles of 30-in. main line loop in various locations.
Status: Pending FPC approval.
Completion: 1959.
Project: 74 miles of 36-in. main line loop in various locations.
Status: Pending FPC approval.
Completion: 1959.
Project: 45 miles of 30-in. main line loop in various locations.
Status: Pending FPC approval.
Completion: 1960.
Project: 78 miles of 36-in. main line loop in various locations.
Status: Pending FPC approval.
Completion: 1960.
Project: 13 miles of 24-in. Louisiana purchase lateral.
Status: Temporary authorization.
Completion: 1959.
Project: 18 miles of 20-in. Pennsylvania and New Jersey loop.
Status: Temporary authorization.
Completion: 1959.
Project: 40 miles of 8 to 20-in. Louisiana purchase lateral.
Status: Pending FPC approval.
Completion: 1959.

• **Transwestern Pipe Line Co.** (Warren Petroleum, Monterey Oil Co., J. R. Butler), Houston.
Project: 635 miles of 24-in. from Perryton and Fort Stockton, Tex., to Roswell, N. M., and 670 miles of 30-in. from Roswell to Topock, Ariz.
Status: Approved conditionally by FPC.
Contractors: **H. C. Price Co.**, Bartlesville, Okla.; **Houston Contracting Co.**; and **R. H. Fulton & Co.**, Lubbock, Tex.

• **Trunkline Gas Co.**, Houston, Tex.
Project: 24.5 miles of 12-in. gathering line from Lowry, La., to Cameron Parish shoreline.
Status: Under way.
Contractor: **Sam Carline, Inc.**, Berwick, La.
Project: 42 miles of 24-in. loop from west of Moss Hill, Tex., to Silsbee, Tex.
Status: Under way.
Contractor: **Sharman, Allen, Gay & Taylor, Inc.**, Houston.
Project: 53 miles of 30-in. loop from Pitkin, La., to Pollock, La.
Status: Under way.
Contractor: **Grayco Constructors, Inc.**, Austin, Tex.
Project: 61 miles of 30-in. loop from Pollock, La., to Riverton, La.
Status: Under way.
Contractor: **APV Co., Inc.**
Project: 60 miles of 30-in. from Brownsville, Tenn., to Canadaville, Tenn., and from Bardwell, Ky., to Polk, Tenn.
Status: Under way.
Contractor: **Panama, Inc.**, Houston.
Project: 62 miles of 26-in. extension from Bourbon, Ill., to Rossville, Ill.
Status: Under way.
Contractor: **Contracting & Material Co.**, Evanston, Ill.
Project: 137 miles of 26-in. extension from Rossville, Ill., to Vistula, Ind.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**, San Francisco, Calif.

• **United Fuel Gas Co.**, Charleston, W. Va.
Project: About 5 miles of 16-in. transmission line near Huntington, W. Va.
Status: Approved by FPC.

• **United Gas Pipe Line Co.**, Shreveport, La.
Project: 14 miles of 12-in. to connect North Henderson field area, Rusk County, Texas.
Status: Planned.
Project: 20 miles of 16-in. lateral in Louisiana.
Status: Approved by FPC.
Project: 87 miles of 30-in. line paralleling part of existing line from Agua Dulce field, Texas, which will be submerged by flood-control program.
Status: Approved by FPC.
Project: 27 miles of 20-in. and three 12-in. Mississippi River crossings near Empire, south of New Orleans, La.
Status: Under way.
Contractor: **Houston Contracting Co.**

• **Valley Gas Transmission, Inc.** (Fish Engineering Corp.), Houston.
Project: 150 to 160 miles of 3 to 6-in. gathering lines to tap fields in Starr, Hidalgo, Brooks, and Jim Wells counties, Tex.
Status: Pending FPC approval.

• **Western Slope Gas Co.**, Denver.
Project: About 3 miles of 4 and 6-in. gathreing line in Northwest Douglas Creek field.
Status: Under way.
Contractor: **W. C. Striegel.**
Completion: November 1, 1959.

Canadian Crude Oil Pipelines

• **Act Oils, Ltd.**
Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Kitimat, B. C.
Status: Pending British Columbia Government approval.

• **Bituminous Oil Pipeline Co.** (Royalite Oil Co., and Can-Amera Oilsands Development, Ltd.)
Project: A 250-mile line from Athabasca oil sands in northeastern Alta., to Edmonton.
Status: Proposed.
Completion: 1960.

• **Gibson Crude Oil Purchasing Co., Ltd.**, Calgary.
Project: 180-mile 8-in. line from Milligan Creek, B. C., to Grand Prairie, Alta.
Status: Permit sought from B. C. government.

• **Independent Pipe Line Co.** (Home Oil Co.), Calgary.
Project: 1,073 miles of 36-in. from Edmonton, Alta., to Superior, Wis.; 946 miles of 34-in. from Superior to Montreal, Que.; 72 miles of 16-in. and 74 miles of 10-in. feeder lines from Calgary to Bellshill Lake, Alta., on the 36-in. line.
Status: Proposed.

• **Mid-Continent Pipe Lines, Ltd.**, Edmonton, Alta.
Project: 1,500 miles of 30-in. from Edmonton to Chicago, via Sask., N. D., Minn., Wis., and Ill. U. S. section to be owned by International Oil Pipeline Corp., New York City.
Status: Pending Canadian Board of Transport Commission approval. W. C. Gilman & Co., New York City, has made preliminary study.

• **Peace River Oil Pipe Line Co., Ltd.**, Calgary, Alta.
Project: 130-mile 12-in. line from Virginia Hills through Windfall to the main line linking with Trans Mountain Pipe Line in Alberta.
Status: Pending government approval.
Project: 8 miles of 6-in., 45 miles of 8-in., and 17 miles of 12-in. from its Fox Creek Pump Station to Windfall, Virginia Hills, and Swan Hills fields in Alta.
Status: Approved.
Project: 220-mile, 8-in. line from Milligan Creek field, B. C., to Dawson Creek, B. C., and Sturgeon Lake, Alta.
Status: Permit sought from B. C. government.
Completion: Nov. 1, 1959.
Pembina Pipe Line, Ltd., Drayton Valley, Alta.
Project: 50 miles of 3 to 10-in. gathering line in Pembina field.
Contractor: **Mannix Co., Ltd.**
Completion: End of October.

• **Producers Pipelines, Ltd.**, Regina, Sask.
Project: 25-mile 4-in. line to connect Parkman Mississippian pool in southeast Saskatchewan.
Status: Pending approval of Saskatchewan government.

• **Rangeland Pipe Line Co.**, Calgary.
Project: 111-mile line from Cessford field to Calgary.
Status: Pending approval of Alberta government.

• **Trans-Prairie Pipelines, Ltd.**, Edmonton, Alta.
Project: 6-8-in. line from Weyburn field to Regina and Moose Jaw, Sask.
Status: Proposed.

Canadian Products Pipelines

• **Foothills Products Pipe Line, Ltd.** (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.

PIPELINE CONSTRUCTION

Project: Gathering system to connect Alta. gasoline plants to trunk line from Alta. to Pacific Coast.
Status: Proposed.

• **Hydrocarbons Pipeline Co.**, Winnipeg, Man.
Project: 800 miles of 6, 8-in. LPG line from near Edmonton to Fort William, Ont.
Status: Has Parliament of Canada approval. Seeking approval of Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board.
Contractor: **Dutton - Williams Brothers, Ltd.**, Calgary, and **A. D. Little Co.**, Boston, are consultants.

• **Pembina Pipe Line, Ltd.**, Edmonton, Alta.
Project: A 1,200-mile line to carry sulfur, LPG, and natural gasoline from Alta.'s gas fields to eastern Canada.
Status: Proposed.

Canadian Natural Gas Pipelines

• **Alberta Gas Trunk Line Co., Ltd.**, Calgary.
Project: 256 miles of 36-in., 75 miles of 30-in., 55 miles of 26-in., 199 miles of various diameter gathering lines, and 42 miles of 16-in. delivery lateral.
Status: Pending approval of Canadian and U. S. regulatory agencies. To start late 1959.

• **Alberta Natural Gas Co., Ltd.** (Pacific Gas & Electric Co., San Francisco, and **Westcoast Transmission**, Calgary).
Project: 108 miles of 36-in. across southeastern British Columbia to U. S. border near Kingsgate, B. C.
Status: Pending approval of Canadian and U. S. regulatory agencies. To start late 1959.

• **British Columbia Electric Co.**
Project: 35 miles of 30-in. from Huntington, B. C., to Vancouver.
Status: Planned.
Completion: 1960.

• **Cartier Gas Corp.** (St. Maurice Gas, Inc., and Consumers' Gas Co., Toronto).
Project: 170 miles from Montreal to Quebec City.
Status: Proposed.

• **Cold Lake Pipe Line Co., Ltd.**
Project: 13½ miles of 6-in. line.
Status: Clearing started in September.
Completion: October 31.

• **Northern Natural Gas Co.**, Omaha.
Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek, Alta.
Status: Planned.
Project: 32 miles of 24-in. from Pincher Creek to Mont. border to tie in with planned U. S. line on to Minneapolis.
Status: Planned.

• **Pacific Petroleums, Ltd.**, Calgary, Alta.
Project: About 7 miles of gathering line in North Jedney field, British Columbia.
Status: Clearing started in September.
Project: About 5 miles of gathering line in South Bubbles field and North Bubbles field, British Columbia.
Status: Clearing started in September.

• **Trans-Canada Pipe Lines, Ltd.**, Toronto.
Project: 500 miles of main-line loops.
Status: Planned.
Completion: Late 1962.
Project: 74 miles of 34-in. main-line loop and 51-mile 30-in. lateral from Emerson, Man., to U. S. border near Noyes, Minn., to connect with proposed Midwestern system now before U. S. FPC.
Status: Pending government approval.
Completion: Fall 1960.

• **Van Tor Oil & Exploration Co.**, Vancouver, B. C.
Project: Line from B. C. mainland to Vancouver Island.
Status: Proposed.
Completion: 1960.

• **Westcoast Transmission Co., Ltd.**, Calgary.
Project: (See Alberta Natural Gas Co., Ltd., for joint project).
Project: 250 miles of 30-in. from Taylor, B. C. to Fort Nelson, B. C.
Status: Planned.

Foreign Crude Oil Pipelines

• **Arab Pipeline.**
Project: 1,250-mile 40-in. pipeline from the Persian Gulf to Mediterranean serving fields in Saudi Arabia, Kuwait, Iran, and Iraq.
Status: Proposed by Saudi Arabian Government as project of Arab countries.

• **Arabian American Oil Co.**, Dhahran, Saudi Arabia and N.Y.C.
Project: 63 miles of 30, 32-in. from Khursaniyah to Ras Tanura.
Status: Planned.
Contractor: Company personnel.
Completion: January 1, 1960.
Project: 18 miles of 34, 36-in. from Qatif to Ras Tanura.
Status: Planned.
Contractor: Company personnel.
Completion: July 1, 1962.
Project: 6 miles of 30-in. from Ras Tanura to Ras Tanura terminal; 4 miles of 14-in. from Buqqa to QA-2 pipeline.
Status: Planned.
Contractor: Company personnel.
Completion: October 1, 1960.

• **Assam Oil Co.**, Digboi, Lakhimpur District, Assam, India.
Project: 600 miles of 20-in. from Nahorkatiya field in Upper Assam to Barauni, India, to connect with Burmah Oil Co.'s proposed 250-mile line from Barauni to Calcutta.
Status: Planned.

• **Barnabos Group** (Italian interests).
Project: A line from Venice, Italy, to Innsbruck, Austria, which could then be extended to Munich, Germany.
Status: Planned.

• **Basrah Petroleum Co.**
Project: 65 miles of 30 and 32-in. from Zubair to Fao in southern Iraq.
Contractor: **Turriff-Burden, Ltd.**, Tulsa.
Completion: 1961.

• **Bolivia-Paraguay.**
Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.
Status: Planned.

• **British Petroleum, Ltd.**
Project: 60 miles of 18-in. across South Wales, from Milford Haven to the Llandarcy refinery.
Status: Under way.
Completion: Late 1959.

• **Burmah Oil Co., Ltd.**, Glasgow, Scotland.
Project: 250 miles of 20-in. from Barauni to Calcutta, India, extending Assam Oil Co.'s proposed line.
Status: Survey under way.

• **C.R.E.P.S., Societe Nationale de Recherche et d'Exploration des Petroles en Algerie (SN Repal) and Cie. Francaise des Petroles Algerie**, Paris, France.
Project: 470 miles of 24-in. from Edjele fields in southeastern Algeria to the Tunisian Mediterranean coast.
Status: Preliminary work under way.
Contractor: **TRAPSA** (transportation subsidiary of CREPS), with technical assistance and supervision of the project by **Bechtel Mediterranean** (subsidiary of Bechtel Corp., San Francisco).
Completion: September 1960.

• **Eastern Block Council for Mutual Economic Aid.**

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PIPELINE CONSTRUCTION

Project: 2,500-mile "Vomecon" pipeline from the Volga-Ural oil fields in Russia to East Germany, Poland, Czechoslovakia, and Hungary. The system will originate at Kuybyshev on the Volga River and will split into two branches at the Dnieper River, one going to Poland and Germany, the other to Czechoslovakia and Hungary. Expected capacity, 300,000 bbl. daily.

Status: Construction under way in Czechoslovakia, with completion of this section by early 1961.

MR. SUPERINTENDENT

STOP
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INSTANTLY

WITH PIPE GASKET PATCH
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DALLAS MFG. COMPANY
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• **Elburz Oil Corp.**
Project: 1,000 miles of 38-in. to move Qum crude to the Mediterranean.
Status: Planned.

• **Empresa Nacional de Petroleo,** Chilean Government company.
Project: 35-mile 8-in. outlet for fields in the Punta Delgada area of Magallanes Province.
Status: Under way.
Completion: March 1960.

• **ENI (Italian state oil agency)** and **Italo-Swiss Finance Co.**
Project: A 700-mile system from Genoa to Aigle, Switzerland, thence northeast to the German border, where it would split with one branch going to Munich and another branch to the Karlsruhe area. Feeder lines would go to Turin, Milan, and Cremona, Italy.
Status: The trunk line from Genoa to Aigle has been approved by the Italian Government.

• **Iranian Oil Particip..nts, Ltd.**
Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bandar Mashur line.
Status: Planned.
Project: 50 miles of 26, 28-in. from Gach Saran field to new terminal at Kharg Island in the Persian Gulf.
Status: Under way.
Contractor: A joint venture of **Raymond Concrete Pile Co.** and **Williams Bros. Co.,** Tulsa, **Richard Costain, Ltd.,** and **John Brown, Ltd.,** London, and **Werkspoor & Bredoro,** The Netherlands.

• **Iraq Petroleum Co.,** London.
Project: 250 miles of 30 and 32-in. in northern Iraq from Kirkuk to the Syrian border.
Contractor: **Turriff-Burden, Ltd.,** Tulsa.
Completion: 1961.
Project: About 60 miles of 30 and 32-in. loop in Syria.
Status: Under way.
Completion: Last half 1959.

• **Israel Government.**
Project: 16-in. loop of 8-in. line on 235-mile Gulf of Aqaba-Haifa system.
Status: Proposed.
Project: Replace 125 miles of 8-in. from Elath to Beersheba with 16-in.
Status: Under way.
Completion: Mid-1960.

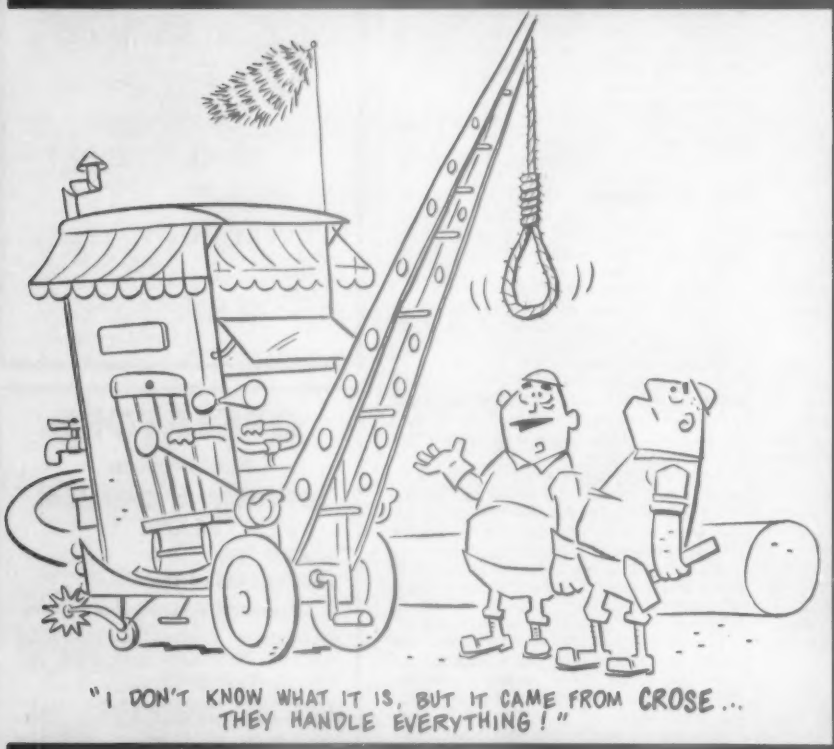
• **Mene Grande Oil Co.,** Caracas, Venezuela.
Project: 24 miles of 16-in. from Zarza to Zulus; 12 miles of 24-in. from West Guara to Oficina; 5 miles of 24-in. near Melones.
Status: Planned.
Completion: 1959.

• **Middle East Pipeline.**
Project: 1,500 miles of 38, 40-in. from Persian Gulf to Mediterranean at Iskenderun, Turkey.

• **Oil India Private, Ltd.,** Digboi, Assam, India.
Project: 30 miles of 12-in.; 230 miles of 16-in. and 460 miles of 14-in. from Nahorkatiya, Assam, to Barauni, Bihar.
Status: Planned.
Completion: April 1962.

• **Pan American International Oil Co.,** New York.
Project: 84-mile 12 to 14-in. line from Comodoro Rivadavia field to Argentina's Atlantic Coast.
Status: Under way.

• **Petroleo Brasileiro S. A. (Brazil).**
Project: 70 miles of 22-in. from Sao Sebastiao to Cubatao.
Status: Pending approval.
Contractor: **Techint, Inc.,** Milan, Italy.
Project: 80 miles of 24-in. to tie in to



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PIPELINE CONSTRUCTION

proposed Caxias refinery near Rio de Janeiro.

Status: Planned.

- **Rotterdam-Rhine Pipeline Co.** (Caltex Petroleum Maatschappij, Bataafsche Petroleum Maatschappij, Gelsenberg Benzin A. G., and Mobil A. G.)

Project: 59 miles of 30-in. and 96 miles of 24-in. from Rotterdam to Ruhr industrial area in West Germany to supply refineries at Godorf and Wesseling, and a 25-mile branch to Wessel to serve the refinery in Gelsenkuchen.

Status: Under way.

Contractor: **Bechtel International Co.,** is project manager. **Associated Pipe Line Contractors** has most of construction. German and Dutch firms have 33 miles of 24-in. in south Holland and four major submarine crossings.

Completion: Mid-1960.

- **Royal Dutch-Shell.**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through eastern France, Luxembourg, West Germany, Netherlands, and Belgium. Main line to be 30-in.

Status: Considering project as joint venture with several other companies.

Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.

Status: Planned.

Contractor: **Williams Brothers Overseas, Ltd.,** Tulsa, and **John Brown, Ltd.,** London.

Completion: January 1, 1962.

- **South European Pipeline Co.** (Jersey Standard, Caltex, and 17 European firms).

Project: 419 mile 30-in. line from Lavera, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany.

Status: Awaiting official approval of French Government.

Completion: 1962.

- **Superior Oil Co., Los Angeles.**

Project: A 16 and 24-in. line from its Lake Maracaibo, Venezuela, production to shore.

Status: Planned.

Contractor: **Pipe Line Technologists, C.A.,** Maracaibo, has design.

- **Syrian Pipeline,** Damascus.

Project: 500-mile line from Karshuk field, Syria, to Mediterranean.

Status: Proposed.

- **Union of Soviet Socialist Republic.**

Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Status: Under way.

(See Eastern Block for information on new East Europe line).

- **Yacimientos Petroliferos Fiscales (Argentina),** Buenos Aires.

Project: 390 miles of 14-in from fields in Neuquen Province, Argentina, to Bahia Blancha on the coast.

Status: Bids requested.

Project: 625 miles of 12-in. from Mendoza to San Lorenzo.

Status: Planned.

- **Yacimientos Petroliferos Fiscales Bolivianos,** La Paz.

Project: 407-mile 12-in. line from Camiri to Sica Sica.

Status: Planned.

Foreign Products Pipelines

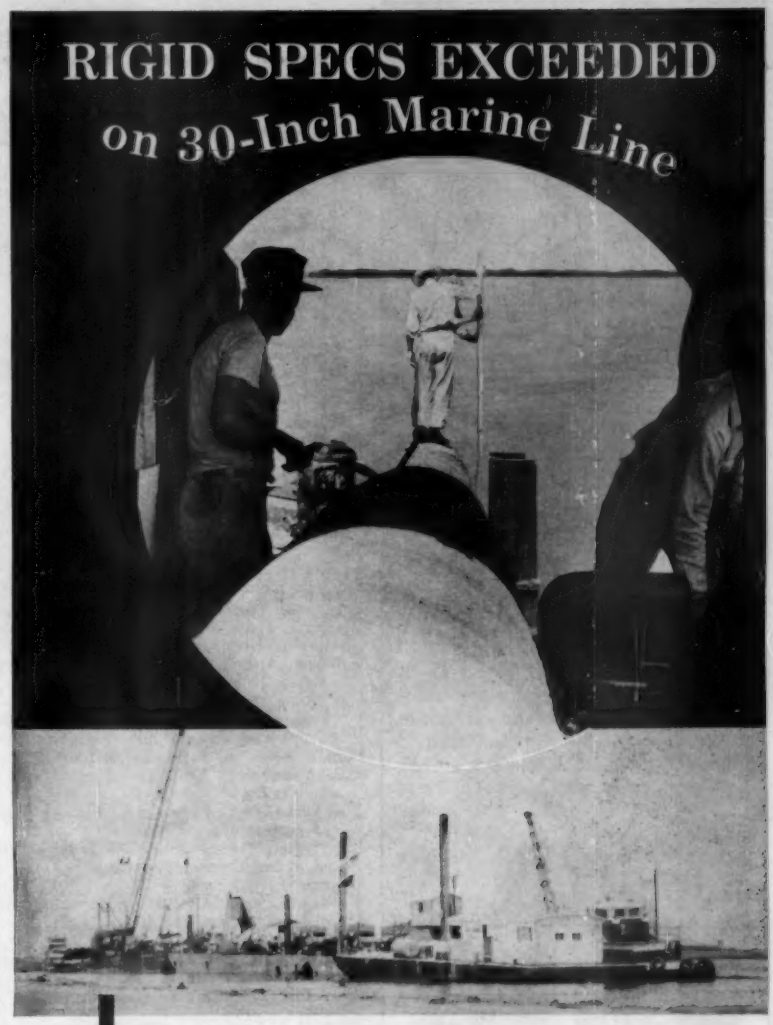
- **Estrada Ferroviaria Santos a Jundiai,** Sao Paulo, Brazil.

Project: 25 miles of 6-in. ethylene line from Cubatao to Rio Grande.

Status: Pending approval.

Contractor: **Techint, Inc.,** Milan, Italy.

RIGID SPECS EXCEEDED
on 30-Inch Marine Line



On Tennessee Gas Transmission Company's new 30-inch line across the Mississippi River Delta a high minimum radius of curvature was specified for laying the pipe. Houston laid the heavy, cement-coated pipe while maintaining a radius exceeding the specification by a full 20%. Houston Contracting's enviable reputation for quality construction has been built on performance such as this.

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PIPELINE CONSTRUCTION

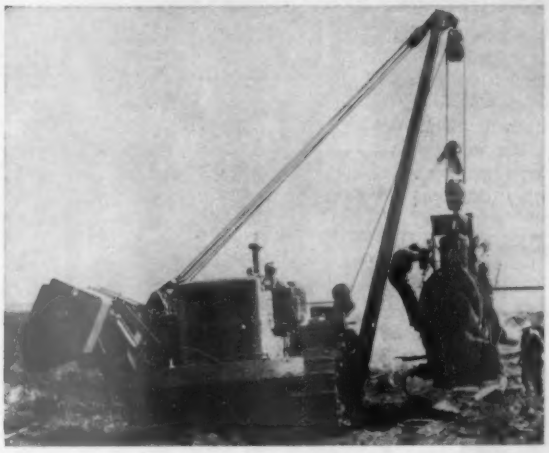
- **National Iranian Oil Co.,** Teheran.
  Project: 510 miles of 8-in. eastward from Teheran to Meshed, Iran.
  Status: Planned.
  Contractor: **Williams Brothers,** Tulsa, has contract for about half this project.
- **North Atlantic Treaty Organization** (Bid details from Bureau of Foreign Commerce, U. S. Department of Commerce, Washington).
  Project: 57 miles of 8-in. in Germany to Land Baden-Wuerttemberg air field.
  Status: Planned.
  Project: 93 miles of 6-in. in Turkey.
  Status: Bids requested in June 1959.
- **Petroleos Mexicanos**
  Project: Line from Mexico City to Toluca.
  Status: Planned.
  Project: Line from Mexico City to Cuernavaca.
  Status: Planned.
  Project: Line from Monterrey to Torreon.
  Status: Planned.
- **Pipelines of Puerto Rico,** San Juan.
  Project: 95 mile 8-in. line from Commonwealth Oil refinery at Penuelas to Catano in the vicinity of San Juan.
  Status: Approved by Puerto Rican Public Service Commission.
- **Syrian Pipeline.**
  Project: About 260 miles from a new refinery at Homs to tank farms in the Damascus, Aleppo, and Latakia areas.
  Status: Planned.
- **Union of Soviet Socialist Republic.**
  Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.
  Status: Under way.
- **Yacimientos Petroliferos Fiscales (Argentina),** Buenos Aires.
  Project: 574 miles of 12-in. from Tucuman to San Lorenzo.
  Status: Under way.
  Contractor: **SARGO** subcontracted this project to **Techint, Inc.,** Milan, Italy.
  Completion: February 1960.
  Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.
  Status: Planned.

Foreign Natural Gas Pipelines

- **Attock Oil Co., Ltd.,** London.
  Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.
  Status: Planned.
- **Creole Petroleum Corp.,** Caracas.
  Project: 17 miles of 30-in., 1.8 miles of 24-in., 1.7 miles of 20-in., and 1.6 miles of 16-in. from Lake Maracaibo flow stations to Conservation plant Bachaquero 1; 22 miles of 12-in. from Bachaquero 1 to Conservation plant Tia Juana 2.
  Status: Planned.
  Completion: June 1, 1960.
- **Cuban Gas Transmission Co.**
  Project: 500-mile line from Campeche area of Mexico across Yucatan and a 150-mile line on the ocean floor to Havana.
  Status: Under study by **Ebasco Services.**
- **French Government,** Paris.
  Project: 400-mile big-inch gas line from Hassi R'Mel field to power plant at Bone, Algeria.
  Status: Proposed.
- **Indonesian Government.**
  Project: 60-mile line from Radja field to proposed ammonia plant near Palembang, Sumatra.
  Status: Planned.
  Completion: Ammonia plant is scheduled for completion in 1962.
- **Kuwait Oil Co., Ltd.,** London.
  Project: 10 miles of 12, 20, and 24-in. line in Burgan field.
  Status: Under way.
  Completion: Fourth quarter 1959.
- **Mene Grande Oil Co.,** Caracas, Venezuela.
  Project: 20 miles of 12-in. from Soto to Mata.
  Completion: 1959.
- **Petroleos Mexicanos,** Mexico D. F.
  Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey.
  Project: 490 miles of 24-in. from Jose Colomo field in the State of Tabasco to Mexico City.
  Status: Under way.
  Completion: March 1960.
  Project: Line from Pemex City to Irapuato.
  Status: Planned.
  Completion: 1960.
  Project: Line from Monterrey to Torreon.
  Status: Under way.
  Completion: 1960.
- **Standard-Vacuum Oil Co.,** New York.
  Project: 60 miles of 8-in. in Sumatra terminating at Palembang.
  Status: Planned.
- **Sui Gas Transmission Co.,** Multan, Punjab, India.
  Project: 130-mile extension of the new 310-mile, 16-in. Multan-to-Sui, Pakistan line. Extension will terminate at Lyallpur.
  Status: Planned.
- **Union of Soviet Socialist Republic.**
  Project: A 465-mile line from Karadag near Baku to Tbilisi and Erevan.
  Status: Under way.
  Completion: 1960.
  Project: A 127-mile line across the Turkmenian Desert from Kizyl-Kum to the Caspian Sea port of Krasnovodsk.
  Status: Under way.
  Project: Two parallel lines, each over 1,200 miles long, from Gazly, near Bukhara, northward to Sverdlovsk and Chelyabinsk.
  Status: Proposed.
  Project: Line from Samarkand, through Tashkent to Chimkent, Dzhambul, Frunze, and Alma-Ata near the border.
  Completion: Line from Samarkand to Tashkent expected to be finished in 1960. Completion of rest of line expected in 1965.
  Project: Line from Gorky to Kazan.
  Status: Under way.
  Project: Line from Kanevskoe (Krasnodar) field to Sulkhumi.
  Status: Proposed.
  Project: Line from Leningrad to Moscow.
  Status: Under way.
- **Venezuelan Atlantic Transmission Corp.,** Caracas.
  Project: 10 miles of 16-in. loop from La Yaguara to Tacagua.
  Status: Planned.
  Completion: January 1960.
- **Yacimientos Petroliferos Fiscales (Argentina), Buenos Aires.**
  Project: 1,015 miles of 24-in. from Camp Duran to Buenos Aires.
  Status: Under way.
  Contractor: **SARGO** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.), subcontracted to COGAR (River Construction Corp., Ft. Worth, Tex.), Milton Brazier, supt. for 700 miles from Buenos Aires to Tucuman, office at Buenos Aires; E. L. "Tex" Maggard, supt. for 400 miles from Campo Duran to Tucuman.
  Completion: August 1960.
  Project: Line from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen province. Line will be 26-in. to the connecting point for the Plaza Huincul link and 30-in. from the connection to Buenos Aires.

▶ ▶ ▶ New Equipment Section

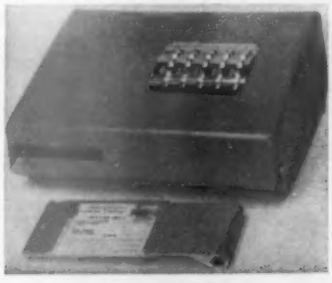
This week's SHOWCASE features . . .



Power-shift transmission for tractor

. . . is now available. Now obtainable on the Model 583 Caterpillar Pipelayer is a transmission that gives instant, one-lever control of gear shifting without interruption of power and momentum. It is built to withstand the demanding of pipelaying service.

On the operator's deck, a speed-range selection lever takes the place of the three levers that formerly controlled gear selection, flywheel clutch, and forward-reverse movement. The result is reduced shifting time, and easy and simplified gear changes. Source: **Caterpillar Tractor Co., Dept. OGJ, Peoria, Ill.**



Recorder speeds credit card work

. . . as it gives a printed total on an invoice for the customer, the dealer, and the oil company. The Readatron recorder provides easy and automatic-operation. To process a credit card, insert the credit card and invoice in the Record-A-Board accompanying the recorder and write the necessary sales information using the Record-A-Board as the writing surface. Next set the amount of sale in dials on the recorder. Then insert in the recorder the Record-A-Board. The recorder then prints automatically. The customer then signs the invoice.

A companion product is the Readatron card converter. It punches all desired information into each retail invoice card automatically, eliminating manual card punching. It operates on standard IBM 024 or 027 numeric card punch. The operator merely loads a deck of imprinted customer invoice cards in the card punch. One person can process 16,000 cards an hour, the maker says.

The recorder sells for about $65 in quantity orders. The converter sells for about $10,000. Source: **National Data Processing Corp., Dept. OGJ, P. O. Box 122, Dallas 21.**

Insulation for portable housing

. . . developed that consists of two sheets of aluminum bonded to a core of Stryofoam. The maker says the insulation will not slip or pack down and so provides complete living comfort in Custom Camp portable housing units in any climate.

The Stryofoam can also be bonded to plywood. It adds strength and rigidity to the housing structure. The portable housing units can be easily erected or taken down. Measuring 8 by 16 or 8 by 10 ft., the units fold down into a 1-ft. thickness and require but one-eighth the shipping rate of erected housing. The 8 by 10 ft. housing unit has a shipping weight of 798 lb. and lists for $995 f.o.b. factory. The 8 by 16 ft. unit has a shipping weight of 1,100 lb. and lists for $1,595 f.o.b. factory. Source: **Custom Camp, P. O. Box 9356, Houston 11.**

Want more facts about equipment or copies of product literature described in this issue?

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Pipe fitting to cut connection cost

. . . of high-pressure branch connections on pipelines has been developed. The W-S TeeLet replaces flanged malleable-iron and forged-steel tees and reducing tees. It is made in sizes of ⅛ through 1½ in. to fit pipe sizes up to 36 in. and with butt-weld, socket-weld, or screwed ends. The pressure rating is the same as that of a 3,000-lb. coupling.

No additional supporting calculations are required when the fitting is used with A-105 Grade B, Schedules 40 or 80 run pipe, the maker says. Inventory requirements can be kept relatively low as the fitting has the contoured end designed to fit more than one pipe size. Source: **Forge and Fittings Div., H. K. Porter Co., Inc., Dept. OGJ, Roselle, N. J.**

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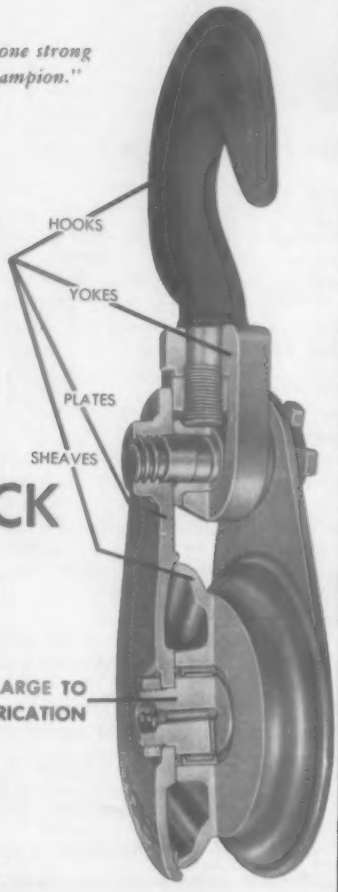
Heat Treated
Selected Steels



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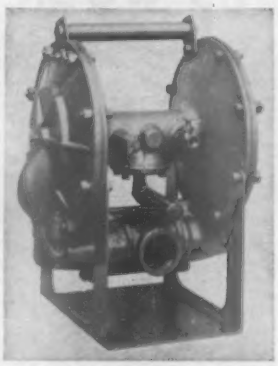


Gas pressure operates utility pump

. . . newly developed for pumping slurries and heavy abrasive fluids such as those encountered in sumps and ditches. It moves such fluids without difficulty. It can also be used for recycling fluids or transferring them.

The TXT Series 9000 pump is a double-acting diaphragm type. Powering pressure enters through a single chamber that connects the two diaphragms. A reversing valve switches pressure from one diaphragm to the other, giving continuous suction and discharge without lost strokes or lost motion. Input to output ratio is about one to one. The pump needs no priming or packing. Diaphragm materials include plastic, Hycar, and Neoprene. Weighing only 61 lb., the pump measures about 16 by 13 by 13 in. Source: **Texsteam Corp., Dept. OGJ, P. O. Box 9127, Houston 11.**

Tool and die-makers kit

. . . is designed to show advantages of rubberized abrasives in solving sensitive deburring, smoothing, and polishing problems. The kit contains 80 wheels and points. These are equally assorted in four grid textures. Included are four mandrels for ⅛-in. chuck. Source: **Cratex Mfg. Co., Inc., Dept. OGJ, 1600 Rollins Road, Burlingame, Calif.**

SHOWCASE . . .

New Equipment

Floodlight takes severe conditions

. . . where smoke, fog, fumes, dirt, and moisture affect floodlight performance. Made of cast aluminum, the socket hood fits under the reflector neck to do away with the problem of loosening of the reflector whereby foreign matter works its way into the light.

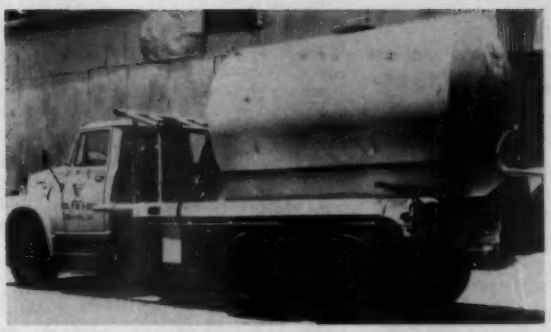
A Clamp-Lok gasket gives a permanent, weatherproof seal at the point of juncture and a J-bolt design gives a vapor tight seal between the cover and reflector. Source: **Appleton Electric Co., 1701 Wellington Ave., Chicago 13.**

•

Electric heating centrifuge

. . . for direct current use is designed to be more compact and lighter than older types. Features include all-aluminum construction and a low profile several inches shorter than previous models.

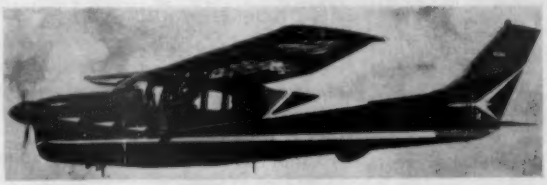
Controlled heat is supplied to the cups throughout the spinning operation. Both the heat and motor switches are equipped with indicator pilot lights. Source: **L-K Pump Valve Co., Dept. OGJ, P. O. Box 901, Houston.**



Unit discharges 90 tons of mud

. . . or dry cement an hour at drilling sites. Called an Airslide pump unit, it is skid-mounted and has a tank capacity of 250 cu. ft. Air requirement is 320 cubic feet a minute at 15 psi. The 90-ton an hour delivery rate is based on elevated discharge through a 25-ft. long, 4-in. diameter hose to a height of 10 ft. above ground level. Test units have moved cement through 100 ft. of hose and up to 65 ft. above ground level at a rate of 1,400 lb. a minute, the maker reports.

The tank unit is filled through a pressuretight top hatch. The tank weighs 4,500 lb. and measures 6 ft. in diameter and 10 ft. long. Material flow is manually controlled. Source: **Delta Tank Mfg. Co., Inc., Dept. OGJ, Box 1469, Baton Rouge.**



Landing gear retracts on new plane

. . . just revealed. The Cessna Model 210 plane is a four-place all-metal single-engine monoplane equipped with fully retractable Land-O-Matic landing gear. FAA certificated at a gross weight of 2,900 lb., the plane has a top speed of 199 m.p.h. and a cruising speed of 190 m.p.h. at 75% power at 7,000 ft.

Other noteworthy features include a low cabin floor that permits easy entrance to both front and rear seats and also provides roomy head clearance for front and rear-seat passengers. The 120-lb. baggage compartment is accessible through an outside loading door when the aircraft is on the ground. Optional equipment includes a new crystal-controlled ARC low-frequency and VHF communication and navigation package. Price of the Model 210 is $22,450 for a standard-equipped airplane. Source: **Cessna Aircraft Co., Dept. OGJ, Wichita, Kan.**

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

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Described in OIL AND GAS JOURNAL · Issue of **October 26, 1959**

NAME..... TITLE.....

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SHOWCASE . . .

New Literature

Catalog discusses 375 chemicals

. . . currently being produced by Dow Chemical. The 1959-1960 general catalog lists properties and uses of the products in 44 pages. The listing includes both established products and developmental items. It features an expanded section on plastics and coatings products. Source: **The Dow Chemical Co., Dept. OGJ, Midland, Mich.**

Safety-engineering equipment

. . . catalog just published provides a guide to the safe handling and application of flammable liquids in the production and maintenance operations of industrial and chemical plants. It gives an outline of problems involved in the use of flammables in individual processes.

Also described are methods and equipment required for safe control and use from receipt on the premises in original containers or drums, through each process or application, to final disposal. The catalog presents physical properties and characteristics of commonly used flammables, and describes engineering principles and methods by which these liquids are controlled in specially designed containers and dispensers.

It's divided into six general plant-operating sections for quick reference. Source: **Protectoseal Co., Dept. OGJ, 1920 South Western Avenue, Chicago, 8.**

Unit ventilator-control uses

. . . manual, recently released, describes automatic-control systems for hot water, steam, gas-fired, and electric-unit ventilators. Actual control applications are shown on each page, covering all makes and models marketed by unit-ventilator companies.

Complete cycles of operation, damper sequence charts, specifications for precise temperature control, and installation data are included for each. Source: **Barber-Colman Co., Dept. OGJ, 1300 Rock Street, Rockford, Ill.**

48-page aluminum-tube

. . . publication contains information on the selection of proper tube alloys, temper designations for aluminum tube, and resistance of alloys to various chemicals.

Complete details are given about seamless-drawn aluminum tube, aluminum extruded tube and pipe, welded aluminum tube, lock-seam and butted-aluminum tubes, and new aluminum tube-in-strip. Photos show different product applications.

Tables include typical properties and property limits of aluminum tube, standard tolerances for all types of tube and pipe, and weights per foot of aluminum tubes in various alloys. Source: **Revere Copper & Brass, Inc., Dept. OGJ, 230 Park Avenue, New York City 17.**

Meter specification sheets

. . . show dimensional drawings, capacity and pressure data, and meter weights. The new, available sheets also give a detailed description of features and attachments available to meet special requirements. The meters are designed to measure flow of crude and refined petroleum products and many other liquids. Typical applications are bulk-loading racks, pipelines, oil and LP trucks, refineries, and factories. Three models provide capacities of 100, 350, and 600 g.p.m. Source: **Liquid Controls Corp., Dept. OGJ, North Chicago, Ill.**

Casing heads for suspending

. . . up to 295,000 lb. of casing in wells of 2,000 psi. are presented in Bulletin 498, obtainable upon request. The four-page literature illustrates the Type G casing head, its "full-opening" through bores, demountable flanged adapters for preventer installation, and male thread adapters for tubing-head installation. It covers two sizes providing five bores for outer-string sizes of 7 to 10¾ in. Source: **National Supply Co., Dept. OGJ, Two Gateway Center, Pittsburgh 22.**

Carbon dioxide plants

. . . together with their design and construction are described in a new folder now available. Flow diagrams are shown for small self-contained shop-assembled plants that produce liquid or solid carbon dioxide from fuel oil and for custom-built plants of any practical capacity that produce the solid or liquid product from a variety of fuels. The eight-page literature piece outlines operating information for gas production, purification, liquefaction, and solidification. Typical installations are pictured. Operating requirements are given for a shop-assembled portable plant with capacity of 300 lb. per hour of liquid carbon dioxide and 240 lb. per hour of dry ice. Source: **Girdler Construction Div., Chemetron Corp., Dept. OGJ, P. O. Box 174, Louisville 1, Ky.**

MACCO

TIME TESTED PRODUCTION EQUIPMENT

MACCO RETRIEVABLE CM2FS-RC "SPRING" FLUID OPERATED VALVE ("No Charge" Bellows)

The CM2FS-RC is an adaptation of the conventional CM2-FS fluid operated valve with an integral reverse flow check valve. This 1½" O.D. valve is designed to be selectively retrievable from Type MM Sidepocket Mandrels. For further information, write for Retrievable Valve Brochure No. 9-01 plus Brochure Nos. 3-12 and 3-13.

MACCO RETRIEVABLE CM1FS-CK "SPRING" FLUID OPERATED VALVE ("No Charge" Bellows)

The CM1FS-CK is an adaptation of the conventional CM1 fluid operated valve. This 1" O.D. valve is constructed to be selectively retrievable from Type K-C Sidepocket Mandrels. The CM1FS-CK Valve was designed with particular emphasis on lifting multiple completions using a common annulus reservoir of supply gas.

For further information, write for Brochure Nos. 3-12, 3-13, 3-21, 3-31, and Retrievable Valve Brochure No. 9-01.

CM2FS-RC CM1FS-CK

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas

Phone UN 1-1253

EQUIPMENT MEN

Alcoa names Ellis Verink, Jr.

. . . manager of chemical and petroleum - industry aluminum sales. Verink, manager of the chemical section of Aluminum Co. of America's sales development division at New Kensington, Pa. since 1948, now will move to company headquarters in Pittsburgh.

Verink joined Alcoa in 1946 as an engineer in the sales-development division. He became manager of the chemical section 2 years later.

M. J. Crose Mfg. Co. purchases

. . . Perrault Equipment Co., Inc., announces Clare G. Miller, president of Crose. Both companies' plants and home offices are in Tulsa, where they have manufactured and sold pipeline-construction equipment to a world-wide market for the past 15 years.

Willis Ditmanson is named

. . . national parts and service manager for Motorola Communications & Electronics, Inc., wholly owned sales and service subsidiary of Motorola, Inc.

In this post, Ditmanson will coordinate the Motorola communications service organization which provides contract maintenance and other service aids to industrial, public safety, transportation, and commercial users of mobile radio and other communications networks. Ditmanson will continue to direct operations of the company's national parts department.

Kobe names Marshall S. Lutz

. . . eastern sales representative, according to W. F. Slater, vice president, sales, for the Huntington Park, Calif., firm. Lutz will headquarter in Detroit.

Lutz joined Kobe, Inc., after 3½ years with Vickers, Inc. In his new post, he will be responsible for eastern sales and service of high-pressure triplex-plunger pumps.

Garrett Oil Tools appoints

. . . three new agents to handle equipment sales in Europe, Africa, and the Middle East.

Rappresentanze Forniture Petrolifere, R.F.P., Milan, will handle Garrett equipment in Italy, the Italian islands, Libya, and Egypt. Societe d'Etudes Petrolieres, Paris, is the new agent in France. French West Africa, Madagascar, Algeria, Morocco, and Tunisia. Sales in Turkey, Kuwait, Iran, the Persian Gulf, and Saudi Arabia will be handled by Ismail Tiner, Arkara.

J&L Supply Division assigns

. . . H. C. King as regional salesman of production machinery at Pampa, Tex., according to W. L. Wolfe, vice president, sales. A Jones & Laughlin employe since 1948, King most recently was district sales manager at Regina, Saskatchewan. In his new assignment, he will report to F. L. McFarland, regional manager at Midland, Tex.

Meanwhile, Wolfe announced three other changes in the division's field sales force. G. N. Jones, salesman at Williston, N. D., has been transferred to Glendive, Mont.; W. R. Woodward, salesman at Wichita, is now assigned to New Orleans; and C. S. Smith, sales trainee at Shreveport, has been promoted to salesman and assigned to Odessa, Tex.

Oil Well Supply Division names

. . . three new field representatives, according to M. F. Jones, Gulf Coast area manager of the U. S. Steel Corp. division.

Appointed were Joe Charles Bradley, Corpus Christi, Tex.; Melvin M. Brunet, Eunice, La.; and William H. Harris, Laurel, Miss.

Retirement of Vern W. Bailey

. . . from Bethlehem Steel Co.'s Supply Division, after 28-years service with the company, has been announced by C. R. Zimmerman, vice president of the Supply Division. Bailey is one of the original employes of Bethlehem, having been with the Supply Division since it was organized. He most recently held the post of northern division sales manager.

V. W. Bailey

Beacon Supply Co. opens

. . . a new branch store at Beaver, Okla., under the supervision of B. J. (Bill) Alexander, former field salesman at the Pampa, Tex. store. Beacon now maintains stores in Pampa and Borger, Tex. and Farmington, N. M. Sales offices are in Amarillo, Dallas, and Tulsa.

Personnel changes include the transfer of D. D. Bleeker from the Farmington store to Beaver, and Ed Dudley from Farmington to Borger.

Doyle Beckham has been promoted to field salesman in the Pampa store, replacing B. J. Alexander. B. R. (Bill) Fritz and Roscoe (Buster) Bundick, Jr. have been employed as floormen in Pampa.

RCA, Foxboro jointly announce

. . . the first completely integrated industrial process-control system linking an all-transistor computer and advanced electronic instrumentation.

Under the arrangement Foxboro Co. is to act as a manufacturer's representative for the sale of Radio Corp. of America's industrial computer products as well as to provide specialized instrumentation and process information.

FINAL ASSEMBLY is made prior to painting and testing the new Axelson 24-in. Hydrax hydraulic pumping unit. Axelson Division of U. S. Industries, Inc., recently started the third production run of the unit. The unit is available in 3,500 to 5,000-lb. polished-rod load capacity and sells complete with prime mover for $700 to $795 f.o.b., Los Angeles.

AMERICAN®

PRESSURE and TEMPERATURE RECORDERS

American® single and two-pen *Pressure Recorders* for pressures from 30 inches vacuum to 10,000 psi.

- Pressure elements individually calibrated over full range.
- Variety of chart drives available.
- Helical elements of different ranges are interchangeable.
- Stainless steel pen arms with span and linearity adjustments.
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American® *Temperature Recorders* for an accurate record of flowing temperatures.

- No ambient temperature errors.
- High sensitivity and torque—fast speed of response.
- Standard 0-150°F. range. Other ranges available by request.
- 24-hour mechanical or 110-v. 60-cy. electric chart drives.

Ask for Bulletins 400 and 408

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)
General Offices: Philadelphia 16, Pa.
Sales Offices in Principal Cities

Angus R. S. Leitch joins

. . . the engineering firm of Barry & Richardson, according to Charles B. Barry, partner. Leitch will work in the firm's Calgary office, which is headed by J. A. Richardson. Leitch previously worked for Petracon Engineering co., Canadian Industries, Ltd., Canadian Gulf Oil Co., C. F. Braun & Co., Ralph M. Parsons Co., and Brown & Root, Ltd.

Kirt Usher appointed manager

. . . of tubular-product sales of Aluminum Co. of America. A member of Alcoa's sales force in Newark since 1946, Usher now makes his headquarters in Pittsburgh, where he is responsible for the sale of extruded and drawn pipe and tubing.

Marino R. Anderson is named

. . . export sales representative for Lone Star Steel Co., reports Walter T. Moreland, vice president in charge of sales. Before joining Lone Star, Anderson worked for an independent oil producer, Shell Oil Co., and Kendavis Industries, Inc. He has been associated with the petroleum industry for the past 10 years in the field of exports and international relations.

Reynolds Metals Co. expands

. . . its marketing organization. W. B. Moore, Jr., director of chemical, petroleum, and farming market sales, announced that the chemical and petroleum markets, formerly combined under Manager L. S. Beeler, now will have individual managers.

Beeler will head the new chemical-process industries market and R. S. Edwards, formerly divisional industrial sales manager at Dallas, will head the petroleum market.

Beeler has 20-years experience in the aluminum industry, all of it involved with production, plant construction, research and development, technical service, and marketing of process-industry products. He joined

L. S. Beeler

R. S. Edwards

Reynolds in 1952 as product supervisor of chemicals. He was named assistant manager of the chemical and petroleum market in 1952 and became manager last year.

Edwards joined Reynolds in 1951 as an engineer in product and market sales development at Louisville. He then served as an industrial salesman at Kansas City and Dallas before becoming Dallas divisional sales manager in 1957.

William McLaughlin is promoted

W. T. McLaughlin

. . . to field sales manager for Protective Coatings Division of Pittsburgh Coke & Chemical Co., according to Arthur E. Gray, the division's general manager. In this position McLaughlin will be responsible for supervision of the division's nationwide sales.

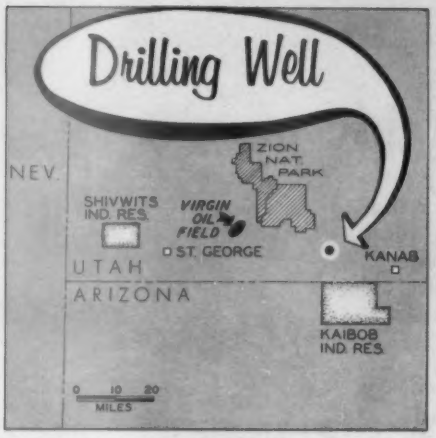
Prior to his promotion, McLaughlin was the division marketing manager. He began with the firm in 1948 as production manager of the Agricultural Chemicals Division. He served in several marketing capacities and later became project manager of commercial development.

Republic Supply Co. replaces Odessa, Tex. warehouse

. . . with this new, modern building built at the same location. The building, besides being a sales office and store, is headquarters for the West Texas district under H. L. (Jelly) Ellis.

The building is 50 by 178 ft. with air-conditioned offices and showroom. The warehouse is insulated with fiberglass and heated by four suspended gas heaters. Four waterproof Coralux panels for every 20-ft. bay in the Republic Blue Ridge steel roof have been installed for natural lighting.

Republic Supply recently widened the street to allow parking in front of the store. Additional parking is available at the side of the store.



REMOTE LOCATION of this rank wildcat is seen on the map. Most of this part of Utah is a stranger to the bit.

MEN ON THE FLOOR of Arapahoe Drilling Co. Rig 6 are (from left) D. T. Hayes, pilot; Joe Christensen, drilling superintendent; and Clem Gillespie, tool pusher.

Can Kanab outpost click?

SOUTHWEST UTAH wildcatting continues to intrigue oil hunters and J. Ray McDermott & Co., Houston, apparently has lost none of its zest for this area.

Currently the firm is drilling its third test in the general vicinity of the Kaiparowits basin. The venture is contracted by Arapahoe Drilling Co. of Denver, who is using an air-equipped rig. Aiding in this program is Well Completions, Inc., Denver, who will provide engineering assistance for the special air-drilling equipment.

The well spots in SW SW Section 2-43s-8w, Kane County, Utah. The 1 State location is 7 miles northwest of Kanab and approximately 28 miles southeast of the Virgin field. The Kaiparowits basin and the Kaibob uplift both lie to the east of the well site. The area is highly complex, being part of the Sevier fault system, and the digging is tough. Considering these factors, it was proposed to use air drilling in an effort to overcome some of the anticipated obstacles in a preplanned campaign.

... **McDermott is no newcomer** to these parts having drilled two previous wildcats in Kane County. Its past experience (OGJ, July 6, 1959, p. 173) includes a 3,652-ft. hole, the 1 Government-Strat in C SE NW Section 19-42s-7w, and a 3,712-ft. probe, the 2 Government in 17-42s. Both ventures were abandoned in the Permian-Kaibob formation.

The new attempt is scheduled for 11,000 ft. and will go through the Cambrian to check the complete section. The Pennsylvanian and Mississippian beds will get jaundiced-eye treatment.

Virgin field, Utah's oldest, was discovered in 1907 (see OGJ, May 25, 1959, p. 262). Over 140 mostly shallow wells were drilled, with 30 of them productive. Total producing area is 480 acres and accumulative production during the past 52 years is only 193,000 bbl. The producing formation is the sandy Timpoweap limestone member of the Triassic-Moenkopi formation. Average depth to the pay is 600 ft.

... **Scenic wonderland** is the most apt description of this part of Utah. To the northwest lies Zion National Park and northeast is Bryce National Park. Not far across the Arizona line to the southeast is the Grand Canyon. Near the well site are the Vermilion Cliffs, Coral Pink Sand Dunes, caves, and cliff dwellings.

Despite abundance of sheer colorful cliffs and deep canyons, much of the region is also characterized by broad benches and grassy prairies that favor general accessibility. Good to fair country roads are prevalent. The climate is ideal for drilling operations with mild winters and hot dry summers for year-round work.

Southwest Utah is virtually untested and there are a multiplicity of known structures. Potential producing zones exist at both shallow and deep zones. One thing is certain—a good strike will induce more drilling. Who knows—perhaps McDermott & Co. will do just that here.

MAKE YOUR WELLS WORTH MORE

Improve Production With Dowell "Tailored" Acids

For many wells, the most promising treatment still is acidizing. In some of these wells, however, acidizing has not been successful because of emulsions, silicate swelling or similar problems.

During more than 27 years of acidizing oil and gas wells Dowell engineers have built up an unparalleled fund of experience in acidizing. They have analyzed the problems that have been encountered, and have developed many acid addition agents to overcome those problems.

Thousands of treatments in hundreds of different fields have given Dowell unmatched experience in selecting the right addition agents and in tailoring treatments to give the operator the best return for his money.

In designing special acid treatments, your Dowell engineer has outstanding qualifications. First, he is backed by the organization that created inhibited acidizing for the oil field. Then, he is personally familiar with the formations and problems in your area.

Important extra benefits, however, come from the research facilities of Dowell and The Dow Chemical Company. When a particularly tough problem arises, Dowell scientists in the Tulsa Research Center are ready to help you. This is additional assurance of success in treating "problem" wells.

To meet the more common conditions, Dowell offers dozens of *proved* addition agents that can be combined to make literally thousands of different treatments. The box below gives just a few examples of how Dowell addition agents are used to improve acidizing results.

For prompt service or detailed information call the Dowell office nearest you. There are more than 165 locations to serve you in the United States, Canada, Venezuela and Argentina. Dowell, Tulsa 1, Oklahoma.

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

In the Panhandle areas of Texas and Oklahoma Dowell acidizing with tailored additives is proving a profitable means of stimulating formations like the Atoka and Mississippi limes.

Here Are Some Well Conditions Where Dowell

If formation temperatures are exceptionally high—

—or acid must remain in contact with tubular goods for an unusually long time, you may encounter serious corrosion. To avoid this, Dowell offers an inorganic inhibitor especially suited for this severe service.

If you want to treat Eocene or Miocene sands—

—your problem may be to remove drilling mud and silt near the bore hole. For this purpose Super Mud Acid with an additional silicate control agent added has produced outstanding improvements.

If your formation is very tight—

—you can usually reduce injection pressures and speed up the return of spent acid by adding a Dowell surface tension reducing agent. These agents are designed to minimize surface tension of either spent or unspent acid. Dowell surface tension reducing agents often reduce injection pressures by hundreds of pounds per square inch. As to return of spent acid, some wells must be given a remedial treatment before the well will produce if acid is used without a surface tension reducing agent.

Addition Agents Make Your Wells Worth More

If you want to acidize a slow-reacting dolomite—

—consider the use of a Dowell intensifying agent to speed the reaction. Wells treated with intensified acid often bring production increases that far outweigh the small added cost. Many wells also hold up better when intensified acid is used.

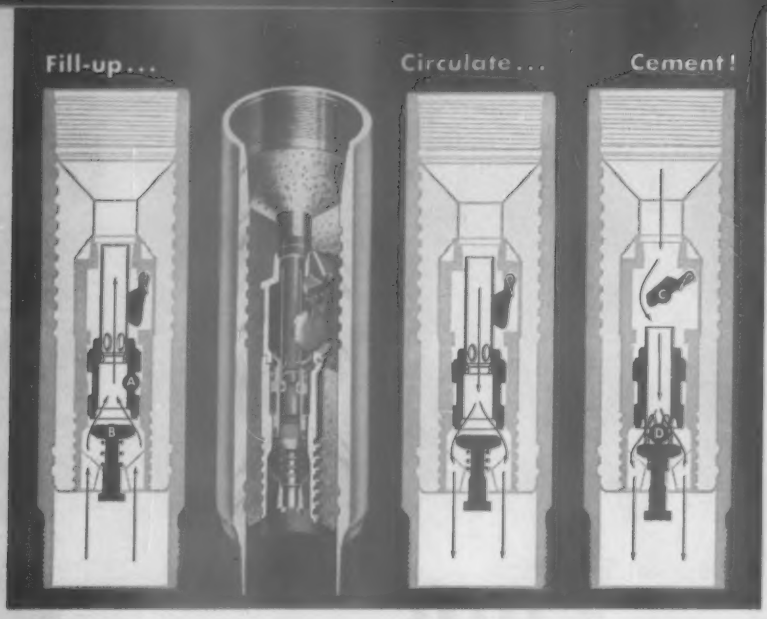
If your formation is extremely permeable—

—you may want to use the new F.L.A.® (Fluid Loss Additive) for acid or water, recently developed by Dowell. This agent actually reduces fluid loss rate to about 25 ml in 30 minutes. This low rate is designed to give deeper penetration, a larger drainage area and thus more profitable treatments.

If you want to make certain—

—rely on your Dowell engineer for help. His knowledge of local field conditions, combined with Dowell's records of successful treatments, are added assurance of the proper treatment for *your* particular well.

NOW—"ACID GUIDE"! NEW, IMPROVED ENGINEERING ADVANCE IN ACIDIZING. ASK YOUR DOWELL ENGINEER FOR DETAILS.



A Valve Sleeve

B Valve Seat

Fig. 1 Running in. Variable Valve opens at slightest pressure build-up, and permits unrestricted fluid entry.

Baker Circulating Differential Fill-Up Collar, Product No. 109-E M&F

Fig. 2 Valve open for circulating and hole conditioning.

C Flapper Valve

D Tripping Ball

Fig. 3 Before cementing, the flapper valve is placed in operation by dropping a tripping ball and applying pump pressure.

NOW you can Circulate with Baker Differential Equipment

New Circulating Differential Equipment permits circulation at any time while running casing and still retains all the important features of regular Baker Differential Equipment.

The variable valve in Baker CIRCULATING DIFFERENTIAL shoes and collars is activated *instantly* by the *slightest* increase in differential pressure. Filling is practically as free as though open-end casing were being lowered, thus preventing the build-up of *any* destructive pressure surges. The rate of fill is *always* in complete balance with the rate of lowering and there is no danger of overfill because the differential valve automatically maintains the fill at a level below the fluid level in the well.

You get relief from pressure surges at the *bottom of the string* where pressure build-up occurs. There are no spring-loaded valves to be forced open during the filling operation—no restricted fluid entry through undersized side ports, ineffectively located a joint or two up the string.

Baker CIRCULATING Differential Equipment, with its integral back-pressure valve can be run in tandem, but cannot be used with floating equipment. Circulating Collars can be run with inexpensive Baker Guide Shoes. The CIRCULATING Shoe can be run with or without a Baker Baffle Collar for stopping the cementing plug.

Baker CIRCULATING Differential Shoes and Collars cost no more than Differential Equipment without the "circulating" feature.

Ask for your copy of this brochure which contains facts you should know about Baker DIFFERENTIAL Shoes and Collars; and Supplement No. CS-342-A on the new CIRCULATING Differential Equipment.

BAKER OIL TOOLS, INC. • HOUSTON • LOS ANGELES • NEW YORK

"... negative thinking never found a barrel of oil ..."

BY KENNETH K. LANDES

This month, John Wiley & Sons will release the second edition of Kenneth K. Landes' widely-used textbook, "Petroleum Geology." In it, the author takes a hard look at his profession's past mistakes and future course. Landes is Professor of Geology at the University of Michigan. He has served two terms as Editor of the AAPG Bulletin, and is an outstanding authority on the problems of petroleum geology. From the galley proofs of his new book, these cogent opinions on the past and future are reproduced.

FROM the very outset of the oil industry one of the greatest barriers to exploration has been ultraconservative thinking. "There would be mirth-provoking irony in a map of the United States showing the boundaries, lateral and horizontal, beyond which dogmatists have at one time or another said oil could not be found—which mental barbed-wire fences have snapped under the irrepressible urge of the wildcatter."[1] Throughout the relatively brief history of oil exploration such man-created barriers as "commercial oil deposits cannot occur in limestones," "structural basins cannot contain oil fields," "There is no oil below the Mississippi lime (or the Dundee or what have you)," "There is no porosity below 15,000 ft.," "The structure is too complicated," "Red-bed areas are barren," and "there is no oil west of the Nemaha granite ridge" have been demolished by men who had both vision and a capability for courageous thinking. Discoveries of oil in the so-called Weber "quartzite" and in sediments of continental origin have blasted two more firmly entrenched prejudices.[2]

Another handicap to discovery has been the tendency to permit a dry hole to condemn an entire township, or county, or even larger area. Actually, of course, a dry hole condemns little more than its own area, and many cases are on record in which producing wells have completely surrounded an earlier dry hole.

The fact that the mental hazards listed above, and countless others, have been overcome does not mean that there are no prejudices today. Every district contains geologists who dogmatically confine the occurrence of oil to certain areas and stratigraphic depths. "Sometimes a geologist becomes convinced that oil cannot occur in an area and finally says he will drink all the oil found there. When this happens, he should ask for a transfer. He has been in the area too long. Negative thinking never found a barrel of oil."[3]

Fortunately, the present trend in petroleum geology appears to be in the direction of less prejudiced thinking. The company geologist must also, of course, weigh the costs of a new exploring venture against the probable returns; therefore economic factors as well as prejudices may lead to the rejection of a proposed exploration. Unfortunately a tendency to underestimate the possible returns has also been responsible for rejection of projects which later proved to be highly profitable. Ultraconservative economic estimating is a discovery deterrent as well as ultraconservative geological thinking.

Future of Geology in the Oil Industry

There is no reason to believe that the demand for oil and gas will not continue to increase each year as it has, with few exceptions, from the very beginning. There are two reasons for this ever-increasing demand. One is the world-wide population increase, averaging a little over 10% each decade. The other (and more important) reason is the great increase year after year in the per capita consumption of petroleum products.

In the highly mechanized United States the average consumption for every man, woman, and child is 15 bbl. per year. Outside of the United States the annual per capita consumption is about 1 bbl.[4] The rapidly expanding use of petroleum products for transportation alone is increasing the demand by leaps and bounds throughout the world.

It has been estimated that the world consumption will be in the neighborhood of 50 million bbl. of oil daily[5] by 1975, over three times the figure for 1957. Most of this oil will have to be discovered between now and 1975, for the greater part of the present known world reserve, estimated at 260 billion bbl., will be used up by then.

The development and growth of the use of atomic energy should not be a cause for concern to the oil and gas industry. In the first place, atomic energy, at present and for some time to come, is far from being competitive on a cost basis with the hydrocarbons; secondly, by the time the two energy sources do become competitive, if ever, the energy requirements of the world will be at such astronomical levels that the help of radioactive material in meeting the demand will be welcome.

It is obvious that if the world demand for petroleum is going to increase threefold in 18 years, the industry is going to need all the help from geology that it can get. Not only is the demand for oil going up rapidly, but also the geological man-hours spent in discovering each million bbl. of oil is rising sharply. This increase is due of course to the fact that we have progressed from more or less obvious traps to hidden traps, and as time goes on, every thousand new traps discovered are better hidden than were the preceding thousand.

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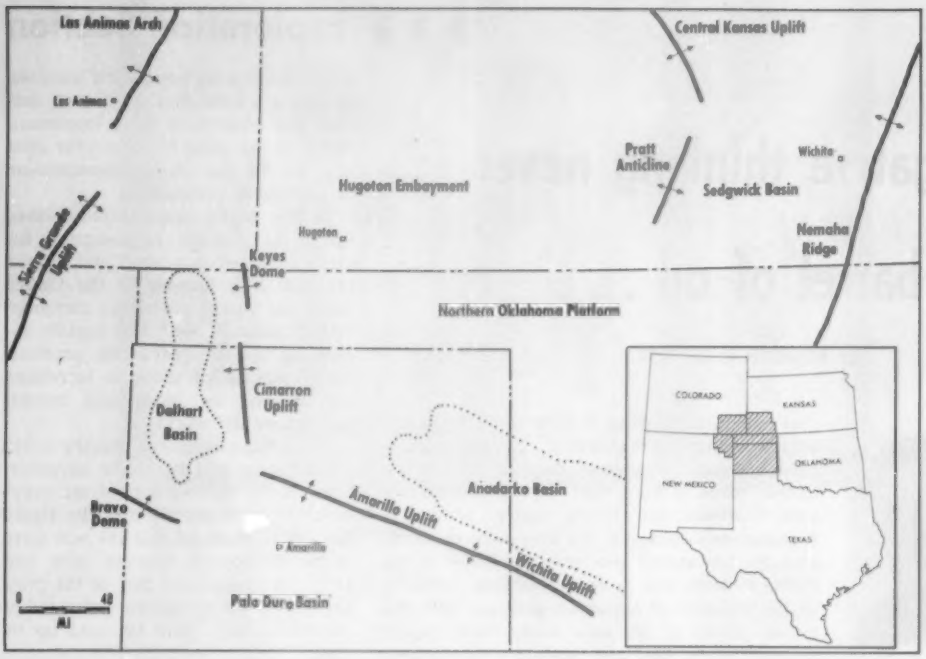
3. Haas, Merrill W., "The Oil Finder," The Link, Vol. 23, May-June, 1958, p. 1.

4. Morgan, Frank A., "Opportunity for Petroleum Geology," AGI Newsletter, April 1952, p. 2.

5. Haas, Merrill W., "Your Future as a Petroleum Geologist," lecture, University of Michigan, Oct. 10, 1957.



TECTONIC map of the lower Mid-Continent region shows relation of the area of study (Amarillo-Hugoton) to regional features. Fig. 1.

These tectonic features point up oil prospects in

Amarillo–Hugoton: fast-growing giant

BY JOHN A. WORDEN
Shell Oil Co., Amarillo, Tex.

John A. Worden holds an AB degree in geology from Princeton University, 1954, and a Master of Science degree in geology from University of Oklahoma, 1959. He is employed by Shell Oil Co., Amarillo, Tex.

THIS ACCOUNT of pre-Desmoinesian isopachous and paleogeologic studies of the Amarillo-Hugoton area points up the tremendous potential of one of the continent's fastest growing oil and gas giants.

The area includes approximately 38,000 sq. miles bounded on the north by Township 24s in southwestern Kansas and southeastern Colorado, and on the south by the southern boundary of Oldham, Potter, Carson, Gray, and Wheeler counties, Texas. The eastern boundary of the area is represented by the Gray and Meade county lines in Kansas, Beaver County, Oklahoma, and the Texas-Oklahoma state line. The area is limited on the west by the 59w range line of Colorado, the western boundary of Union County, New Mexico, and Oldham County, Texas (Fig. 1).

Regional Tectonics

The Amarillo uplift represents the general southern limit of the area of study. There is no surface expression of the uplift in this area, although to the southeast it is demonstrated by the Wichita Mountains of Oklahoma.

This paper is an abridged version of a Master's thesis presented to the University of Oklahoma.

This Amarillo-Wichita positive complex extends northwestward from Wheeler County to Moore County, Texas.

The Amarillo uplift is flanked on the south by the Palo Duro basin and on the north by the Anadarko basin. The Anadarko is the elongated synclinal feature occupying the east-central part of the area. It trends in a general northwest-southeast direction, and plunges markedly to the south and east away from the surrounding platform areas; the maximum basinal development lies north of the Wichita Mountains in southwestern Oklahoma.

The Hugoton embayment is a shallow, basinal northwest extension of the Anadarko basin in the Oklahoma Panhandle and southwestern Kansas. It is bounded on the west by the Sierra Grande-Las Animas uplift, on the north by the Central Kansas uplift, and on the east by the Pratt anticline.

The Dalhart basin is a north-south trending basinal feature flanked on the west by the Sierra Grande uplift. Limiting this basin is the Las Animas arch to the northwest, the Bravo dome to the southwest, the Amarillo uplift to the southeast, and the Keyes dome-Cimarron uplift complex to the east.

The Keyes dome-Cimarron uplift complex is a north-south striking system of structurally high features and appears to join with the northwest end of the Amarillo uplift. The Cimarron uplift delineates the Dalhart basin and separates it from the Anadarko basin.

Contour Maps

The maps presented here are not true structure maps inasmuch as they represent the configuration of the Precambrian, Viola, and pre-Pennsylvanian surfaces. Although these surfaces are generally controlled by structure, each has been modified by ero-

sion. The maps are therefore called "contour maps" but may be considered to illustrate the generalized structure of the area.

The exact age of any particular structural feature cannot be determined from one contour map alone. Structures appearing on the Precambrian contour map, for example, are not necessarily the products of Precambrian deformation; any or all of them could be as young as Quaternary in age and merely be reflected in the basement complex. Therefore, the maps are to be compared, one to the other, to determine an approximate age for any regional structural changes.

Unconformities at the top of the Arbuckle, Simpson, and Sylvan strata have been recognized and are indicated on the stratigraphic chart (Fig. 2). Only those unconformities of greater magnitude have been drawn.

Top Precambrian . . . The contour map on the top of the Precambrian (Fig. 3) illustrates the combined effects of Precambrian and later erosion as well as structural adjustments accumulated to the present.

The surface slopes regionally to the south and east into the central deep part of the Anadarko basin. The synclinal axis of this basin strikes northwest and is reflected as far north and west as Texas County, Oklahoma.

In the extreme southwestern counties of Kansas, there is a shallow basinal extension of the Anadarko basin. This extension indicates the structural control which was later fundamental in producing the Hugoton embayment.

In northern Union County, New Mexico, and Las Animas County, Colorado, there are structural sags extending to the west. These synclinal depressions preserved several Paleozoic units as westerly reentrants between the Las Animas and Sierra Grande uplifts.

The anticlinal arch trending northsouth along the western margin of the area represents the Sierra Grande-Las Animas complex. This feature affected the depositional limits as well as the post-depositional erosional limits of the rock units in this study.

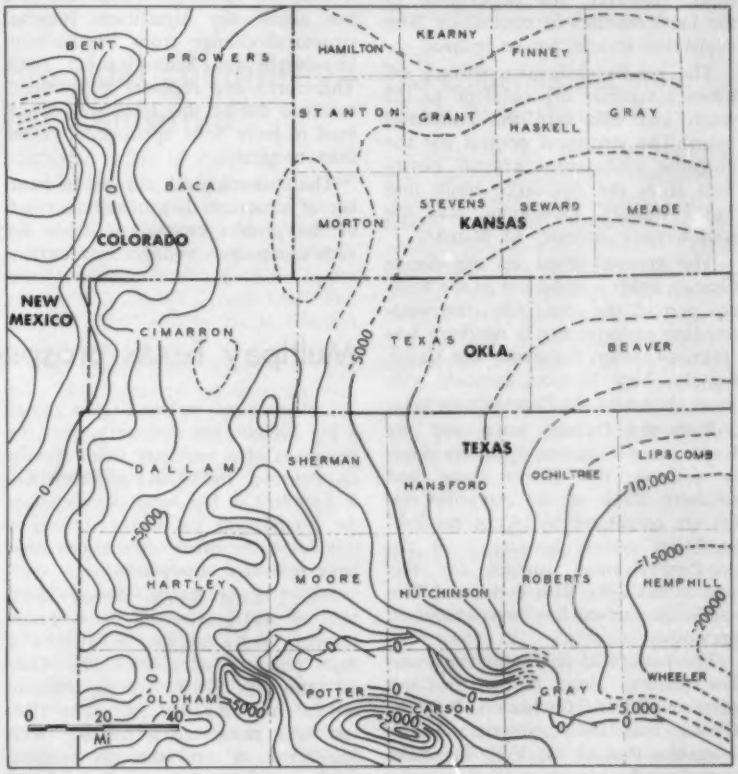
From Cimarron County, Oklahoma, south to Hartley County, Texas, there extends a moderately well-defined basinal area. This structural depression controlled the formation of the Dalhart basin.

In northwest Oldham County, Texas, there is a high domal structure called the Bravo dome.

The elongated ridge extending from eastern Cimarron County, Oklahoma, south to western Moore County,

ERA	SYSTEM	SERIES	FORMATION	
PALEOZOIC	Pennsylvanian	Atokan	"Bendian"	Atoka "Fm." "13-Finger" Ls.
		Morrowan	"Bendian"	Morrow "Fm." Keyes Ss.
	Mississippian	Chesterian		Chester Ls., Sh., & Ss.
		Meramecian	"Mississippi Lime"	Ste. Genevieve Ls. St. Louis Ls. Spergen-Warsaw Ls.
		Osagean	"Mississippi Lime"	Keokuk Ls. Burlington Ls. Fern Glen Ls.
		Kinderhookian		Kinderhook Sh. "Misener" Ss.
	Devonian	Ulsterian	Hunton Group	Bois D'Arc Ls. Haragan Ls.
	Silurian	Niagaran	Hunton Group	Henryhouse Ls.
		Alexandrian	Hunton Group	Chimneyhill Ls.
	Ordovician	Cincinnatian		Sylvan Sh. Fernvale Ls.
		Champlainian		Viola Ls.
			Simpson Group	Tulip Creek Fm. Bromide Fm. McLish Fm. Oil Creek Fm. Joins Fm.
		Canadian	Arbuckle Group	Arbuckle Ls.
	Cambrian	Croixian	Arbuckle Group	Reagan Ss.
Precambrian Complex of Igneous and Metamorphic Rocks				

GENERALIZED stratigraphic chart of the Amarillo - Hugoton area illustrates the many pay zones in the five-state region. From Cambrian to Atokan, only seven zones do not produce. Fig. 2.



CONTOUR MAP on top of the Precambrian illustrates the combined effects of Precambrian and later erosion as well as structural adjustments accumulated to the present time. Fig. 3.

Texas, is a basement reflection of the Keyes dome-Cimarron uplift structural complex.

Extending from southwest Moore County to southern Wheeler County, Texas, is the Amarillo uplift. The Precambrian surface on top of this structure is remarkably flat compared to the steep negative gradients of the north and south flanks. Erosion following the Amarillo-Wichita orogenic movement can account for this flat-topped appearance.

The northwest-southeast pattern of faulting along the north flank of this uplift is the result of the Amarillo-Wichita movement. The faults are largely of the normal type with the downthrown side to the north. No faulting has been hypothesized for the south flank of the uplift.

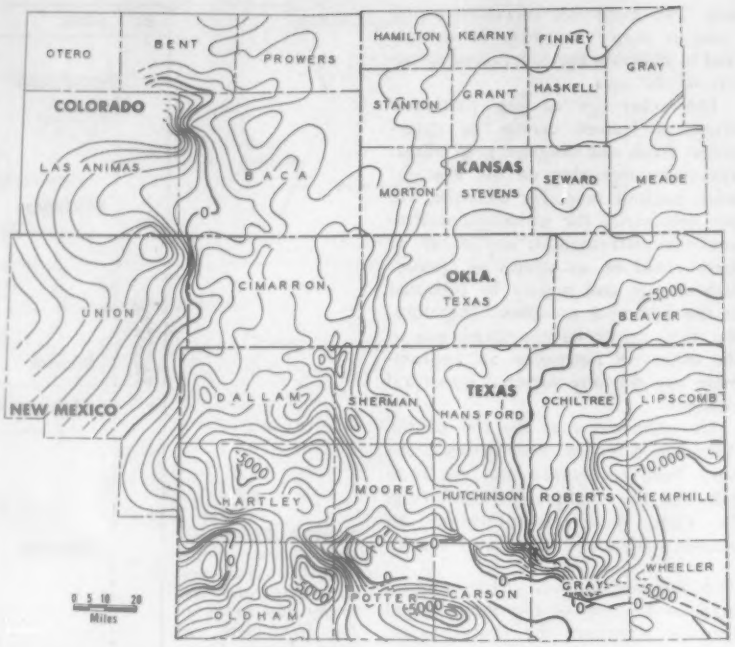
Base of Pennsylvanian . . . The pre-Pennsylvanian surface is to a great extent erosional and therefore varied (Fig. 4). There is also a greater degree of control for this surface, and this results in a more detailed and erratic configuration. These erratic variations, whether due to control or erosion, tend to mask structural trends of regional significance. Only the major trends of highs and lows will be considered as structural implications. However, the importance of the local features in controlling later deposition should not be ignored.

The pre-Pennsylvanian surface exhibits a familiar dip or slope to the south and east into the Anadarko basin. The structural control for the Hugoton embayment extends northwest from the Anadarko basin into Texas County, Oklahoma, and the southwestern counties of Kansas.

The general trend of the Sierra Grande uplift is indicated in the western part of the area. Also, the west-trending embayments in northern Las Animas County, Colorado, and Union County, New Mexico, coincide with those shown on the Precambrian map.

Both the Dalhart basin and the Keyes dome-Cimarron uplift are clearly defined. The Bravo dome and southern flank of the Amarillo uplift are contoured on top of the Precambrian system because it is the pre-Pennsylvanian surface for this part of the area. This contoured Precambrian surface has been discussed previously.

The pattern of alternating high and low features along the north flank of the uplift in Hutchinson, Roberts, Carson and Gray counties, Texas, resembles that of the Viola-Fernvale. However, the structures appear to be more sharply defined on this surface as a result of greater control than is available for the Viola-Fernvale surface.



CONTOUR MAP, base of Pennsylvanian. Pre-Pennsylvanian surface is to a great extent erosional and therefore varied. Fig. 4.

The two maps presented here did not show any significant regional structural change from Precambrian through pre-Pennsylvanian time. Therefore, any regional adjustments incurred during this time are considered to have been epeirogenic rather than orogenic.

The chronological increase in number of structures is primarily a result of the greater control available for each successively younger surface contoured. However, local structures could have developed throughout early and middle Paleozoic time which would not appear on the Precambrian and earlier surfaces because of this lack of control on the older strata.

Acknowledgment

The author wishes to thank Shell Oil Co. for its assistance in preparing this Master's thesis.

(Part 2, next week, will discuss three pertinent cross-sections and the Morrow thickness in the area.)

Multipay Texas prospect taps Ellenburger

Upton County in West Texas gained a big Ellenburger discovery, plus the prospects of a multipay field. Neville G. Penrose, Inc. 1 King Ranch Oil & Lignite Co. has been completed in the Ellenburger but further testing is scheduled in other formations that have indicated production.

No. 1 King Ranch flowed 232.6 bbl. of 51°-gravity oil in 4 hours through ¼-in. choke, to give it a daily potential of 1,395.6 bbl. Gas-oil ratio was 520:1. Tubing pressure on the test was 950 psi. The flow test was made after treating with 1,000 gal. of acid through perforations at 10,145-80 ft.

The pool opener is 3 miles southeast of King Mountain field, in SW NW Section 26, Block 2, MK&T Survey, and about 4½ miles northeast of McCamey.

Operators have announced plans to make a dual completion from the Devonian. Earlier tests in the Devonian at 8,310-8,516 ft. flowed 60 bbl. of oil and 33 bbl. of water in 24 hours.

Other possible pays are the Strawn at 7,958-85 ft., which flowed 8 bbl. of oil an hour, plus 7 M.M.c.f. of gas, and the Canyon which recovered 3,700 ft. of oil with no water on test at 7,450-84 ft.

On ground elevation of 3,099 ft., 1 King Ranch picked the Devonian at 8,090 ft. and the Ellenburger at 9,942 ft. Total depth is 10,186 ft.

In Judy Creek, Swan Hills, Virginia Hills . . .

Alberta sells petroleum rights

A TOTAL of $7,667,471 was realized recently by the Alberta Government when it sold 13,849 acres of Crown Reserve petroleum and natural-gas rights within the province. Main interest in the sale was once again centered around offerings in the Judy Creek-Swan Hills-Virginia Hills district of Central West Alberta. Total bonuses from those three areas alone totaled $6,450,835 which were accepted for a total of 4,160 acres.

Actually eight separate half-section tracts were offered in the Judy Creek area; while three one-section parcels were placed up for public tender in both Swan Hills and Virginia Hills. Of those, the eight at Judy Creek were sold, one at Virginia Hills brought a successful tender and the others at Swan Hills were also all purchased.

Imperial Oil Ltd.'s bids—totaling $3,931,561 alone—were successful on seven of the eight Judy Creek tracts; while Shell Oil Co. of Canada, Ltd., purchased the one at Virginia Hills for $165,555; Mobil Oil of Canada, Ltd., placed identical bids of $751,751 each on two of the Swan Hills tracts and Plymouth Oil Co. tendered the only other successful bid in this particular area by paying $435,200 for the other Swan Hills parcel. The other tract at Judy Creek, meanwhile, was bought by Atlantic Refining Co. for $415,015.

Although the Judy Creek region was of most interest and brought the highest total bonuses, the Swan Hills region was responsible for the highest prices per acre. Mobil Oil's bids worked out to $2,349 per acre while the Plymouth Oil tender was the equivalent of $1,360 per acre. Bids at Swan Hills started at the low price of $1,296 per acre by Atlantic, and ranged up to $2,006 per acre which Imperial paid for its highest-priced lands. Shell's successful bid at Virginia Hills worked out to $258 per acre.

The Judy Creek district in particular, which lies some 14 miles south of the main development sector at Swan Hills, is still an unknown quantity. However, information received to date on the wells indicates that there are currently 11 Beaverhill Lake zone oil producers. Those producers are spread out over an area of 6 miles in length and 3½ miles in width. Only producer in the area to date is Imperial Oil Ltd. and that firm—which was responsible for finding the oil-productive structure in this particular area—is keeping information on the development a closely held secret. The prices that that firm paid for additional rights at Judy Creek, however, must indicate that it has a sizable pool.

Swan Hills, one of the original Beaverhill Lake oil areas discovered by Home Oil Co., Ltd., during early 1957, is now a large field. It contains at present some 60 producers and during the last week on record averaged 7,528 bbl. per day. Virginia Hills is as yet not a very big pool and in fact is split into two separate development regions. The original discovery well, also found by Home Oil, has not grown to the extent initially calculated. At present it contains only three producers. Shell Oil Co. of Canada, Ltd., discovered oil a short distance southeast of it and it is there that the recent lands were sold and around which the main development is being carried out at the present time.

Like Judy Creek the other two fields are also an unknown quantity and will remain so for some time as all stepout extension and exploratory information, as well as some fringe-development information is being held confidential by operating companies.

Big dual completion for California

PRODUCTION in the Bridge Pool, South Mountain field, was successfully extended 1,000 ft. southwest of the nearest producer by Shell Oil Co.

The outpost, 17 Saticoy, was dually completed. Production from the upper zone at 8,287-8,854 ft. was 1,020 bbl. daily of 35.6°-gravity crude through a 24-/64-in. choke.

The lower zone made 493 bbl. daily 34.5°-gravity crude from perforations at 9,485-10,730 ft.

California's Kern continues success

In California, Midway-Sunset field, Kern County, one of the state's older oil fields, continues to yield excellent wells with the latest being a 300 bbl. daily well located on General Petroleum Corp.'s Moco 34 lease in SE NE 34-12n-24w. The General Petroleum well, 188 Moco 34, was drilled on the north edge of the lease. It was completed in the interval at 2,168-2,612 ft. making 307 bbl. daily of 14.5°-gravity crude through a 7/64-in. casing choke and 28/64-in. tubing choke. Production was cutting only 1% initially.

An interesting feature of this well is that it is located less than ½-mile north of California's famed Lakeview gusher which at its time in 1910 was the biggest oil well ever drilled. The Lakeview wildcat roared out of control for 18 months during which time it produced an estimated 9,000,000 bbl. of oil. It flowed at a rate of 125,000-90,000 bbl. daily for the first month and then steadied to a constant 50,000 bbl. daily for a long time. This famed gusher was bottomed at 2,200 ft., virtually the same as the General Petroleum 188 Moco 34.

Prospects good for San Emidio well

PRELIMINARY testing on a Richfield Oil Corp. well being drilled on the north flank of the San Emidio Nose field gave promise of being one of the field's biggest wells when completed.

The test, 58-4 Osborn, is located in SW SE 4-11n-21w. On a segregation test through four holes between 11,579-80 ft., it flowed at a rate of about 1,500 bbl. daily of 29.6° gravity crude. The testing was continuing.

Old California gas area yields extension well

Production in the old Petaluma gas field of northern California's Sonoma County was successfully extended ¼ mile northwest of the nearest producer by Blu-Cal Oil & Gas Corp. The new well, 1 Gambonini, was perforated between 1,500-07 ft. and completed flowing 2 M.M.c.f.d. This area was originally drilled as far back as 1926 with limited success. It is far removed from any of the state's other oil and gas provinces, being located just north of San Francisco.

Nebraska's Willson Ranch steps west

Western Nebraska's Willson Ranch field was extended last week at British-American Oil Producing Co. 1 Alexander-C, C SW SW 9-17n-53w, Banner County.

The "J" sand Dakota Cretaceous producer swabbed 256 bbl. of oil in 24 hours. Swabbing continues. Production is through a casing window at 5,555 ft. This new extension is ¼ mile west of the field.

BY CARL HOOT

DELAWARE discovery is Argo Oil Co. 1 Neal, a 500-bbl. well located a long way off the beaten path of previous Delaware drilling in the basin, indicated by shaded area. In the same area, Mobil Oil Co.'s pre-Permian wildcat has been assured of discovery production in the base of the Permian.

Along the Texas-New Mexico line . . .

Trio crowds Delaware border

THREE WELLS, in the Delaware basin area of Southeast New Mexico and West Texas, loom as important discoveries of the year.

These wells are at opposite ends of the basin. Two of the wells have been completed as discoveries, the third is a deep exploratory test that has already made heavy oil and gas flows from intermediate depths, but is to be drilled ahead to contract depth of 20,500 ft.

On the Texas side of the basin, near its southeast boundary, Argo Oil Co. 1 J. O. Neal rates as an important Delaware oil find. Completion potential was for 542 bbl. of oil a day from 20 ft. of Delaware sand pay at 4,782 ft. The gage was through small choke, under tubing pressure of 1,500 psi., which is relatively high for Delaware production.

No. 1 Neal promises to be a giant step to the southeast of the big drilling-play area in the West Texas portion of Delaware basin. It is some 60 miles southeast of the larger Deleware fields in the Culberson-Reeves-Loving areas.

Until recently, when 1 Neal drilled into high-pressure gas and blew out at 4,808 ft., some operators had a rather dim view of Delaware prospects in this particular portion of the basin. When Argo's well was brought under control, operators started testing their find. Acid treatment through perforations between 4,782-4,800 ft. resulted in a flow of 23 bbl. of oil an hour through ¼-in. choke.

The Argo discovery is 20 miles northwest of Fort Stockton, in northwestern Pecos County. Location is NW NW Section 42, Block OW, TTRR Survey.

Deep Prospect

Mobil Oil Co. 1 Kathleen J. Moore, 2 miles south and 7 miles west of the Argo discovery, is shaping up as one of the basin's best deep prospectors.

Projected depth at 1 Moore is 20,500 ft. At total depth of 15,017 ft. the bit had penetrated something like 5,000 ft. of Wolf camp formation. Drill-stem tests at intervals throughout this thick section have indicated oil and gas production.

Like the Delaware discovery to the northeast, Mobil's test first attracted attention when it blew out at 15,017 ft., total depth, early in September, making an unreported amount of gas. Operators closed blowout preventers and brought the blow under control.

No. 1 Moore indicated discovery production in the Wolfcamp early in June of this year, when drilling had reached 10,890 ft. The well started flowing oil through open casing with the aid of gas lift from open hole between 10,890-95 ft. In 13 hours it produced 175 bbl. of oil. Coming out of the hole, it unloaded another 150 bbl. of oil in 15 minutes. Operators ran pipe back to 7,800 ft. and the well flowed 86 bbl. of oil in 6 hours. Deeper intervals have resulted in recovery of oil, or oil and gas-cut mud, down to 12,477 ft.

Hole was being conditioned at 1 Moore to drill ahead when it encountered a fishing job. At last report a whipstock was being set at 13,500 ft. to drill around the remainder of junk in the hole.

Success of these two wells could shift interest for both deep and medium-depth drillers to the southern portion of Delaware basin.

Gas discovery on the northwest . . . Meanwhile an important Morrow (Pennsylvanian) gas discovery was completed southwest of Carlsbad in Eddy County, New Mexico. This well is Humble Oil & Refining Co. 1 Bandana Point Unit in 12-23s-23e.

Humble's test has been completed as a shut-in gas well, with an initial potential of 1,800 M.c.f.d. Although not a large producer, the discovery has attracted considerable attention because of its location 20 miles southwest of Carlsbad, and 18 miles northwest of present Morrow gas production in the Black River area.

No. 1 Bandana Point Unit produces through perforations between 9,782-96 ft. Top of the Morrow member was picked at 9,582 ft., on elevation of 4,026 ft. Total depth was 12,262 ft., in Ellenburger dolomite.

Humble's well is the most westerly in this portion of Eddy County. The well isn't big, but it will offer geological control for further tests. Sun Oil Co. and Union Oil Co. are said to be ready for exploration in the immediate area but locations have not been reported.

Arkansas wildcat taps Smackover production

A wildcat 1½ miles west of the dual McKamie-Patton field, in Lafayette County, southwestern Arkansas, is making a small Smackover oil producer. It is 2¾ miles northwest of Canfield.

The well, Janlyn Oil Co., Inc., 1 Pan American, in 36-17s-25w, is being put on the pump after swabbing 7 bbl. of 43.5°-gravity oil with 5 bbl. of water per hour.

Its pay is perforated at 9,412-23 ft. in hole drilled to 9,444 ft. McKamie-Patton field produces from the Smackover at 9,000 to 9,400 ft.

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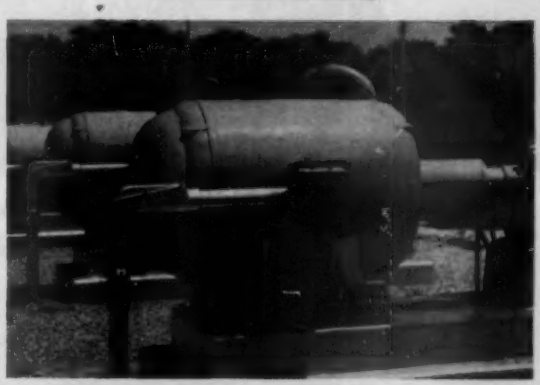

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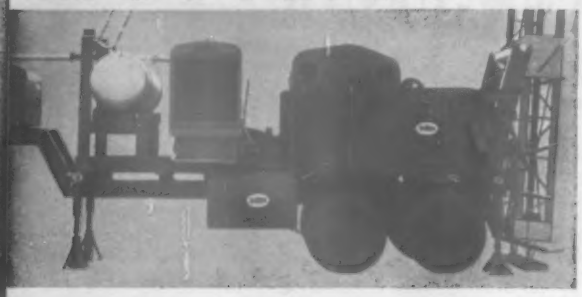

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Remote wildcat slated for North Colorado

A remote wildcat location was announced for Moffat County, just south of the Wyoming line in northwestern Colorado.

Lion Oil Co. will take 1 Dry Gulch down to 8,800 ft. for a look at the Mesaverde Cretaceous. Location is in NW NE 32-12n-93w, an area of little previous activity. The nearest well is about 7 miles southwest in 5-11n-94w, a dry hole. Nearest production is at Little Snake field, 9 miles west in Colorado, while nearest Wyoming production is 6 miles northeast in South Baggs field.

Illinois basin action:

All three states in the Illinois basin were heard from last week. Important developments were noted in Wayne, Jefferson, and Lawrence counties, Illinois; McLean County in Western Kentucky, and Posey County in Indiana.

Illinois . . . In Wayne County, 2 miles southwest of Orchardville and 8 miles southwest of Johnsonville, Ted Lindsay 1 Nelson Keen, SW NE SE 31-1n-5e, swabbed 2 bbl. of oil per hour, natural, from Aux Vases Mississippian at 2,792-2,810 ft. After fracture, it swabbed and flowed 20 bbl. per hour.

In Jefferson County, F. L. Strickland extended South Divide pool to the northeast at 2 Johnson in 6-2s-5e, 5 miles northeast of Mount Vernon. Casing is set to test McClosky lime at 2,856 ft. A drill-stem test at 2,861-71 ft. recovered 2,830 ft. of clean oil and no water. The 1 Johnson in the SWc 6-2s-4e, made 114 bbl. per day several weeks ago from McClosky at 2,880-87 ft.

In Lawrence County, Wm. Zu-Hone, Jr., has his eighteenth successful well out of 19 trys in Lawrence County. Fifteen of these wells are in the area 5 miles south of Lawrenceville. The 1 L. T. Ackman, NE NW NE 6-2n-11w, made 67 bbl. of oil per day from Cypress early this year to open the play. Some of the wells make up to 125 bbl. per day from Cypress. Another pay is the Paint Creek sand. The 1 C. Buchanan is the newest well. It is located in SW NW SW 6-2n-11w. Testing continues in Cypress and Paint Creek.

In Kentucky . . . McLean County has a new strike 1 mile southeast of Congleton near Roland Ferry. The strike is Bruce-Howard, Inc. 1 Edward N. Frisse in 21-N-25. It made 25 bbl. of

oil per day, pumping natural, from McClosky lime at 1,195-1,205 ft. Location is 2 miles from other McClosky production.

In Indiana . . . Posey County gained a Tar Springs well at Weal Drilling Co. 1 Claude and Ethel Wilson in NE NW NW 20-6s-14w, 6 miles northwest of Mount Vernon. The well is a ¾-mile stepout. Swabbing got 1 bbl. per hour at 2,130-39 ft.

Tulsa firm has Kansas discovery

New gas production was opened in west-central Kansas by Apache Oil Co. The new discovery is in Pawnee County at 1 Schartz, NW NW SE 31-20s-16w, 2 miles southeast of Carpenter field.

This Mississippian find flowed 1,250 M.c.f.d. from perforations at 4,210-20 ft. Total depth is in the Viola lime at 4,312 ft.

Kentucky wildcat has straight-hole trouble

In Bell County, southeastern Kentucky, United Fuel Gas Co. is having trouble keeping straight hole at 1 Knuckles, a rank wildcat east of Pineville.

The well was drilled to 3,082 ft. but is now being plugged back to 1,000 ft. Test is being drilled with rotary tools and is a short distance from the Pine Mountain thrust fault.

Three sites set for Oregon drilling

Eastern Oregon's Vale-Ontario basin may see three wildcats drilled soon. According to Northwest Oil Report in Portland, W. H. Martin and Maynard J. Davies will spud the first of a three-well program on a 30,000-acre block in 18 and 19s-45e, Malheur County. This basin had several wells drilled a few years back. The deepest is El Paso Natural Gas Co. 1 Federal in 5-20s-44e. It went to 7,470 ft.

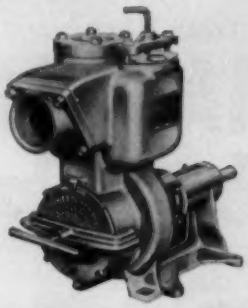
In Whatcom County, Washington, Puget Sound Development Co. will put a well down in 11-39n-1e. Location is 5 miles northwest of Firndale and 3 miles southeast of Standard 1 Firndale, a dry hole in 5-39n-1e. It went to 6,231 ft. Puget Sound's wildcat will test the Eocene Chuckanut formation.

Drilling wells . . . There are three wildcats drilling in Washington, two in Oregon. Shell Oil Co. 1 Thompson, 34-12n-1w, Chehalis basin, Lewis County, is drilling at 3,262 ft. This is the third such test for Shell in the basin. Location is 14 miles southeast of Chehalis and 7 miles southeast of the recent dry hole at 1 Sturdevant in 27-12n-2w. That well went to 8,468 ft. The new test will try for upper Eocene Cowlitz and McIntosh sands.

In the Ocean City area, Grays Harbor County, Northwest reports that Tideland Oil & Gas Corp. 1 Carlisle-Estate in 23-20n-12w, was suspended. Swabbing recovered some oil and gas. Plans call for pulling liner and running casing to take in lower zones.

Wn-Cal Exploration Co. 1-22 Swanson in Ocean City area, 22-18n-12w, will continue to swab. The latest swab test got 8 bbl. clean oil.

In Oregon's Dallas area, Polk County, Ross R. Mitchell and Associates 1 Paige, 11-8s-5w, is drilling at 292 ft. toward Upper Eocene at 1,000 ft. In Nashville area, Lincoln County, Oregon Oil & Gas Corp. 1 Roberts, 25-10s-8w, is waiting on drill pipe. Depth is at 2,360 ft. This one plans to go to Eocene Burpee at 2,500 ft. Location is on south flank of anticline.



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Tests continue at North Dakota wildcat

Swab tests continue at a new wildcat discovery prospect in Dunn County, 3 miles south of production at the south end of the Nesson anticline in North Dakota.

This important hit is Amerada Petroleum Corp. 1 Signalness Unit in SW SE 10-148n-96w. Total depth is 11,660 ft. with casing set at 11,635 ft. Recovery on a drill-stem test at 11,555-11,607 ft. in Duperow Devonian rocks was 6,140 ft. of free oil. A test in Madison-Mississippian at 9,402-56 ft. got 45 ft. of free oil. If successful, this wildcat would open first production in Dunn County, and would move production on the anticline to its southernmost point.

Phillips employes set safety mark

The employes of Phillips Petroleum Co.'s land and geological department recently completed 2,000,000 man-hours of work without a disabling injury. This safety record was set by the approximately 1,000 employes from October 1958 to September 1959, and is continuing.

Work performed by many of these employes is carried on in hazardous conditions and includes marsh, upland, and mountain seismic exploration involving shot-hole drilling, the handling of explosives, and the use of heavy equipment; exploration for petroleum and uranium reserves by use of stratigraphic core drills and surface geological parties; and the building of specialized equipment and electronic instruments.

C. O. Stark, vice president, land and geology, congratulated employes on their safety achievement, saying, "Credit for this record goes to every individual employe. It has been possible only through our combined efforts to work safely and efficiently during the past 11 months."

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Oil strike hinted in northern Oklahoma

Woods Petroleum Corp. has an oil discovery in northern Oklahoma's Noble County, 1 mile south of East Billings field. The discovery is 1 Back, C NE SE 28-24n-2w. A drill-stem test in Chat at 4,426-41 ft. got 160 ft. clean oil, 60 ft. of mud-cut oil and 55 ft. of heavily oil and gas-cut mud. Production tests pend.

Sooner well taps Tonkawa-Pennsylvanian

Tonkawa-Pennsylvanian gas-condensate production opened in Woods County, northwestern Oklahoma. The discovery well is Calvert Drilling Co. et al 1 Romjue, 10 miles southwest of Alva and 2 miles northwest of Avard Mississippian field.

The new strike made a calculated absolute open flow of 14 M.c.f.d. and 15 bbl. condensate per million. Perforations are at 4,893-4,928 ft.

Ohio pool registers half-mile stepout

IN OHIO a ½-mile stepout to production in Frog Run pool, Perry Township, Muskingum County was announced by the operator, Ohio Fuel Gas Co.

The 2 C. A. Sayre, 3rd Q., had a natural gage of 1,370 M.c.f.d. and 7,110 M.c.f.d. after fracture with a rock pressure of 1,115 psi. The Clinton sand was logged at 3,941-393 ft.

West of Moxahala, in Pleasant Township, Perry County, a westward extension of the pool by Preston Oil Co. 1 O. E. Corp. Section 25, made 100 bbl. oil and 157 M.c.f.d. in a 24-hour test 10 days after fracture.

The Clinton sand was logged at

3,480-3,509 ft. and had 15 gal. oil and 2 M.c.f.d. natural.

In the same pool, Taft McGee 2 J. W. Longstreith, Section 24, gaged 1,550 M.c.f.d. and 20 bbl. oil in a 24-hour test 5 days after fracture.

Natural production from the Clinton sand at 3,579-3,603 ft. was 1,113 M.c.f.d. and 25 gal. oil. Location was about 100 ft. south of a dry hole that recorded a showing of oil in 1916.

Continental Oil Co. has scheduled a rank wildcat in southwestern Ohio in Hamilton County on 1 Walter C. Brisbin, Section 13, Crosby Township.

Oklahoma Panhandle well completed

The Laverne district, astride the Beaver-Harper county line in northwestern Oklahoma's Panhandle, gained a Tonkawa Pennsylvanian gas-condensate well at Sinclair Oil & Gas Co. 1 Eades, C SW NE 29-3n-28eCM. The well flowed 4,640 M.c.f.d. and 12 bbl. condensate daily from perforations at 5,686-96 ft. Testing continues.

Layton well finaled in Sooner's Grant

A flowing oil discovery was completed last week in northern Oklahoma's Grant County. The discovery well is LeCuno Oil Corp. 1 Schultz in NE NE SE 36-25n-4w, ½ mile southwest of Salt Fork field. The well flowed 240 bbl. of 44°-gravity oil daily, natural, on ½-in. choke from perforations in the Lower Layton sand at 4,496-4,502 ft. This is a new pay for the field.

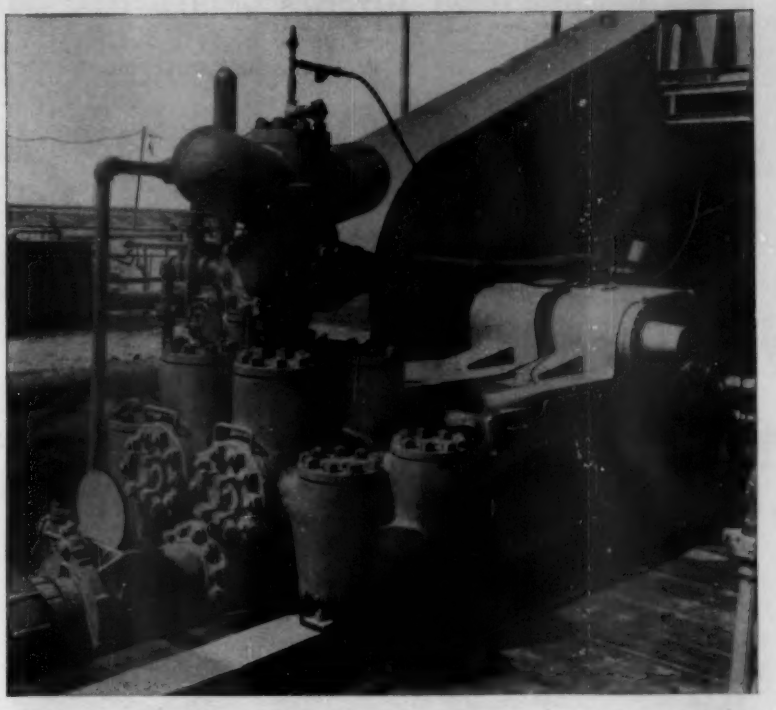
Regular field pay, the Skinner Pennsylvanian sand, flowed 360 bbl. of oil per day on ½-in. choke from perforations at 5,027-47 ft.

Ohio deep test taps oil, gas

A DEEP Ohio test, Devonian Gas & Oil Co. 1 Conrad Mueller in Section 2, Dorset Township, Ashtabula County, came in as a gasser and oiler. Flow was 3,300 M.c.f.d. and 20 bbl. of oil per day, after fracture. Production is from a Medina sand of Silurian age. Total depth of this wildcat is 6,342 ft. Production is at 3,701 to 3,740 ft.

Devonian's discovery is 13 miles south of the main Monroe-Conneaut gas play area and is 7½ miles southeast of Beldon & Blake's recent discovery in northern Denmark Township. That well, the 1 Fowlie in Section 17, Lot 1, was potentialed for 500 M.c.f.d. and 25 bbl. of oil per

After trying this one . . . the user said:



Make all future replacements with National Pulsation Dampeners!

This picture shows one of the new National Pulsation Dampeners that have been serving in the field on a long, severe test period. The aim of this field trial was to determine whether this new unit would eliminate the expensive, time-consuming operational and maintenance problems of other dampener designs.

How close we came to a bulls-eye can be gauged from the fact that when this user reviewed the results, the word went out to make all future replacements on the company's pumps with National Pulsation Dampeners!

This is not surprising, when you consider that the new National design completely eliminates troublesome rubber diaphragms, bags, and sleeves. The only rubber element is a simple disc valve, which can be replaced easily and inexpensively. Furthermore, the units operate on rig air; no separate supply of high pressure air or nitrogen is needed for precharging. A valve functions automatically to retain air pressure when the pump is shut down.

National Pulsation Dampeners are designed for use on all large pumps in the 500 hp-and-up range. They handle up to 5000 lbs. working pressure, are tested to 8000 psi, and are available as original equipment or for replacement on any of the pumps in the field. Ask or write for a bulletin which describes this newest addition to our drilling accessory line.

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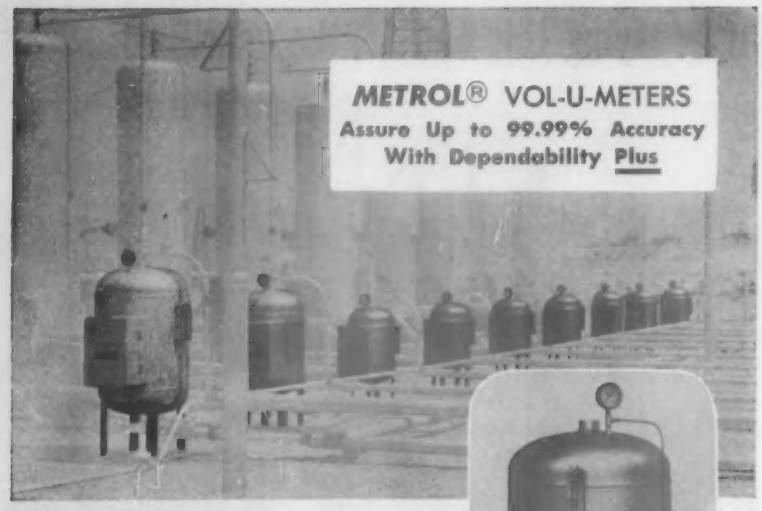

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day from the same section of Medina. Devonian's well was drilled on a Hiawatha Oil & Gas Co.-Benedum-Trees farmout.

Texas A&M offers geology short course

The Department of Geology and Geophysics of Texas A&M College will offer a special course on "Fundamentals of Geology" for the petroleum industry from November 30 through December 18, 1959.

The course is designed for engineers, physicists, chemists, mathematicians and lawyers as well as supervisory personnel who have had no formal training in geology but need a basic understanding of the geologic processes. The course will include selected topics in physical, historical, structural, petroleum, and subsurface geology.

The course will include a total of 45 hours of lecture and 60 hours of laboratory work during a three-week period. The registration fee is $200 and the course carries no college credit. Reservations should be made as soon as possible as the enrollment will be limited to approximately 25 men. Admission to the class will be based entirely upon the dates that applications are received.

East Linden confirmation in new Texas pay

A 1-mile extension to the recent triple-zone Cotton Valley discovery of East Linden field, East Texas, has been announced by Pan American Petroleum Corp. The field's second well also had prospects of a new pay zone in the Travis Peak formation.

Pan American 1 S. Shelton is a confirmation to the firm's 1 Earl Giraud. On production tests 1 Shelton flowed 29.5 bbl. of 48.5° oil an hour through 14/64-in. choke, for a daily rate of 708 bbl. Pay was the Cotton Valley at 10,492-10,560 ft. No. 1 Giraud flowed at the rate of 500 bbl. of oil a day from three separate producing zones in the Cotton Valley.

The new-pay prospect is the Travis Peak, which returned 630 ft. of 36° oil on a drill-stem test at 6,934-50 ft. Pan American will continue tests on both zones in the new well. Their Giraud discovery had only water in the Travis Peak.

No. 1 S. Shelton is 1 mile east of the Giraud well, in the Joshua Turner Survey, A-1032. Pan American owns full interest in the well and the Linden area discovery, plus full interest in an 8,300-acre block in the area.

The two wells are approximately 5 miles southeast of the town of Linden, and 5 miles northwest of Kildare field which has production from the Glen Rose and Pettet.

Winter storms slow Wyoming drilling

Wyoming developments last week, slowed somewhat by the first winter storms, centered in Big Horn basin, Powder River basin, and Green River basin.

Husky Oil Co. has an upper Phosphoria discovery in the TE Ranch area of Park County in northwestern Wyoming. The well got 232 bbl. of oil and 10 bbl. of water per day from the Permian formation on pump.

In northeastern Powder River basin, Rozet field in Campbell County moved north at Colorado Oil & Gas Co.'s extension well which made 250 bbl. per day on pump. The field has six wells on production.

In Weston County's Lone Tree Creek field, Paul Stock's extension well flowed 846 bbl. of oil daily during a 10-hour test. Later the well was choked to 600 bbl. per day.

Morrison Jurassic tests were staked on the east side of the Powder River basin by British-American and Dow & McHugh. One is in Niobrara County, the other in Weston.

Two new units were approved in the Green River basin. One is Fogarty Draw in Sublette County—a Belco Petroleum block—and the other is Muddy Creek unit in Carbon County—a Pan Am block.

Kansas' Cahoj field has 10 active spots

Northwestern Kansas' Cahoj field, Rawlins County, has 10 active locations. Skelly Oil Co. staked four new spots last week.

The pool was opened earlier this year with production in Pennsylvanian. There are nine producing oil wells in the field with three dry holes along the south and east sides. There remains an extensive area of no previous drilling to the northeast and west of the field's present producing limits.

Buffalo extension pumps oil in South Dakota

An extension well to Buffalo field in Harding County, northwestern South Dakota, pumped oil at the hourly rate of 5 bbl. from perforations in the Red River Ordovician. This well is Shell Oil Co. 14-17 State in SW SW 17-21n-4e, ¾-mile-west stepout from field production.

600-foot length of Thermoid-Quaker hose, self-propelled both off and on the reel, floated on inflatable rubber "sausages."

Quaker Thermoid floating ship-to-shore rig helps speed oil storage for new arctic air base

Increased air traffic over the polar route has called for an immense new airfield and oil-piping system at Frobisher Bay, Baffin Island, just completed by Foundation Company of Canada Limited.

Tankers pump petroleum products through a 600-foot Thermoid-Quaker Floater Hose assembly to a 15,000-foot pipeline feeding the huge tank farm at Frobisher. An 8" Thermoid-Quaker discharge hose is floated on special inflatable Thermoid-Quaker pontoons and reeled on a power winch. This three-part rig makes up the complete Thermoid-Quaker assembly.

You do away with bulky metal drums for floating hose when you use this new Thermoid-Quaker rig. Inflatable floats take up less than a quarter of the space formerly required by floating drums. And the hose comes in such long sections that couplings are reduced by as much as 90%.

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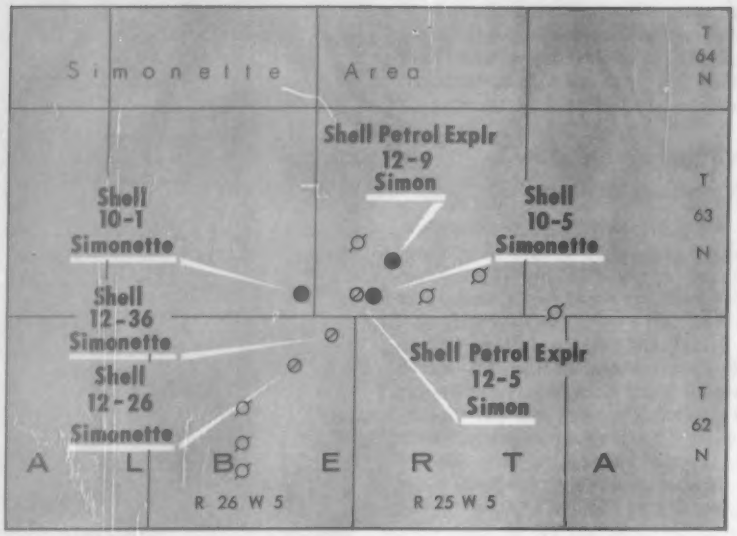
Here are statistics for Central Kentucky

LISTED BELOW is the number of wells, production, and counties in Central Kentucky as of October 1, 1959. This is production from wells in the shallow boom area of the state for September. These figures are from one company only. Other companies purchase oil in the area and the number of wells and production from which they buy oil is not listed.

County	No. of wells producing	Bbl.
Green	1,997	662,567
Taylor	90	93,011
Metcalf	37	32,348
Cumberland	5	1,086
Hardin	17	3,801
Hart	8	360
TOTAL	2,154	793,173



SIMONETTE RIVER—an Alberta Devonian D3 reef producer—has three producers and three drilling or completing. No information is available on the wells shown as drilling from the operator Shell Oil Co. of Canada, Ltd. Simonette River was opened at Shell et al. 12-9 last November. Two other producers were completed last March. Map from Daily Oil Bulletin.

Confirmation set for State Line Unit

Green River basin's new State Line Unit field has its first extension going. It is Gulf Oil Corp. 3 Unit in SE NE 18-12n-94w, Sweetwater County, southwestern Wyoming.

Gulf will go to Wasatch Tertiary seeking the pay zone in the discovery well which was completed in September. That well had a calculated open flow of 9,200 M.c.f.d. from perforations at 2,710-29 ft. The first well on the unit was a dry hole drilled last year.

Other basin news . . . Mountain Fuel Supply Co.'s third well on the Pioneer Unit flowed more than 1,100 M.c.f.d. on tests. Two wildcats on this block were dry.

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Remote Kit Carson exploration set

Remote exploration features Denver basin news. Honolulu Oil Corp. will take a wildcat to the Arbuckle Cambro-Ordovician in Kit Carson County, eastern Colorado. The well will seek the Pennsylvanian at about 6,600 ft. Another test in the area had shows in that zone.

J. M. Huber Corp. has run casing at the indicated discovery in eastern Kiowa County, 18 miles from production. A drill-stem test in the Lansing-Kansas City Pennsylvanian indicated production several weeks ago.

Two Texas fields edge closer together

Joining of the expansive, multiple-pay North Rincon and Sun fields, in Starr County, Southwest Texas, came another step closer last week with the completion of a good oil producer about midway in the 2-mile gap between the two fields.

Possible linking well is Sun Oil Co.'s 5-A Hall-State, in Section 336, C. B. Simpson Survey. It flowed at the rate of 128 bbl. of 43.3°-gravity oil per day through 3/16-in. choke.

It is rated as the discovery well of a new reservoir and extension for North Rincon field, slightly less than a mile southwest. Its pay is perforated at 6,204-14 ft. Sun field is about the same distance northeast.

Deep exploration slated for Texas' Terrell

Deep exploration is spreading a little farther into northwestern Terrell County, West Texas.

Mobil Oil Co., Inc. has announced location for a 17,000-ft. wildcat to be drilled in northwest Terrell County, 23 miles northwest of the Brown-Bassett field area. The project will be drilled as 1 Alfred A. Drummond, in Section 5, Block 2, CCSD&RGNG Survey. Mobil holds 648 acres around the well site.

Edna field revives in Gulf Coast area

Abandoned since 1954, the old Edna gas-producing area, northwest of Edna, in Jackson County, Texas Gulf Coast, is coming back to life.

Tennessee Gas Transmission Co. and Carrl Oil Co., joint operators, have just drilled three new wells, completing two as gas producers, and the third as a dry hole.

The one gas well on which final production tests have been reported is dually completed in Frio sands perforated at 4,870-78 ft. and 4,806-13 ft. Open-flow potential is 15,300 M.c.f.d. from the upper zone, and 10,300 M.c.f.d. from the lower pay.

This well, 1-A Drushel, was drilled to 7,410 ft. The other gasser, 1-B Drushel, is waiting potential tests but flowed on preliminary ungaged tests. It was drilled to 5,510 ft. Gas is dry.

Edna was discovered in 1921 as one of the earliest fields in the Central Coast region.

Sharing Jackson County interest last week was a prolific new dual-zone gas discovery 6 miles south of Edna. There, H. H. Howell completed his 1 Turner-Hannah with an open-flow potential rating of 224 M.M.c.f.d. from its two zones, one perforated at 5,492-97 ft., and the other at 5,911-13 ft.

Location, in the John Kinn Survey, is slightly less than 1½ miles south of John Coffee field, where there is one gas well, completed in 1954 from a 5,300-ft. Frio sand.

Jackson continues one of the most active counties in the central coastal region. New exploration this year has resulted in a succession of discoveries, both oil and gas. Among them are several promising gas-productive areas.

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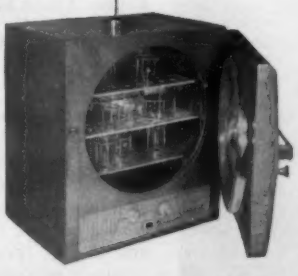

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Alaska's Cook Inlet last winter saw . . .

Seismic crews replace fishermen

SHORAN station was set up near Homer in fading winter sun.

FISHING boats ply Alaska's Cook Inlet in summer, but last winter an extensive geophysical operation stirred its waters. With winter weather and its accompanying rough waters and heavy winds at their worst, a group of 11 oil companies, with Standard Oil Co. of California's Western Operations, Inc. as operator, undertook one of the most hazardous seismic tasks in the books. Other companies in the group were Continental Oil Co., Ohio Oil Co., Pan American Petroleum Corp., Richfield Oil Corp., Shell Oil Co., Sunray Mid-Continent Oil Co., Superior Oil Co., Texaco, Inc., Union Oil Co. of California, and Western Gulf. The contractor was Western Geophysical Co.

The target . . . Target waters for this complex operation are adjacent to the Kenai Peninsula where oil was discovered at Swanson River by Standard and Richfield 2 years ago. The seismic operations had to be done in winter because of the vast fishing operations in those waters during the summer months.

Four Western Geophysical boats specially equipped to operate in winter arrive at Seldovia in January. Plans called for the project to begin in Turnagain Arm, working south ahead of the advancing ice. But the explorers met ice midway between

BOAT-TO-OFFICE contact by radio is maintained.

PROFILES are arranged by project coordinator, Bob Kropschot.

(Photos Courtesy "The Standard Oiler")

Kasilof and Ninilchick, and work was restricted to waters as far south as Kachemak Bay until the spring thaw.

The problems . . . Bob Kropschot, Standard of California's crew geophysicist, coordinated the 45-man project. Weather, fishing interests, and more weather were the big factors in early planning of this project. Public hearings were held before the Alaska Fish & Game Department, and considerable planning was done with other fish and wildlife agencies.

. . . Precautions. The group used a special explosive which previously had proved itself not dangerous to fish during offshore seismic work in California. The charges were exploded at shallow depths (from 5-10 ft. down). Underwater detection devices were used to enable boats to avoid schools of fish. The Fish and Game Department also took along a boat as a watchdog for the expedition.

Discovery wells

WESTERN CANADA

Alberta: McAlester 11-34-30-22 Ghost Pine, LSD 11, 34-30-22w4. Indicated basal Quartz oil discovery. TD 4,880 ft.

COLORADO

Logan County: Cabeen Exploration Co. 1 Sun-Cerveny, C SW NW 29-11n-55w. IPF 7,500 M.c.f.d., "D" sand discovery, new field. TD 5,800 ft. Skull Creek.

LOUISIANA OFFSHORE

Breton Sound Area: Geological-Geophysical Associates, Inc., 2 State Lease 2464, Block 1, Breton Sound, off St. Bernard Parish. IP 108 BOPD, 12/64-in., 37.6°, GOR 1,300 cu. ft. per bbl., TP 1,175 psi., perf. 7,430-35 ft. TD 7,550 ft. New pay and first oil well for Breton Sound Block 1 field.

SOUTH LOUISIANA

St. Mary Parish: Quintana Petroleum Corp. 1 Williams, Inc., Unit 2, 24-15s-9e. IP 5,500 M.c.f.d., 36 BOPD, 10/64-in., 37.2°, TP 9,650 psi., perf. 15,050-60 ft. TD 15,102 ft. Second well and new pay in Garden City field.

MONTANA

Toole County: Cardinal Petroleum 1 Gordan Christian, C NE NE 13-35n-2e. IPF 7,200 M.c.f.d., Swift discovery, new field. TD 2,780 ft. Madison.

NORTHWEST NEW MEXICO

Rio Arriba County: Continental Oil Co. 28-1 Jicarilla-Apache, C NW SE 28-25n-4w. IPF 202 BOPD, Dakota discovery, new field. TD 7,650 ft. Dakota.

El Paso 16-33 San Juan Unit 31-6, SE SW 33-31n-6w. IPF 1,952 M.c.f.d., Mesaverde; IPF 1,783 M.c.f.d., Dakota. Dakota discovery, new field.

San Juan County: Southern Union Gas Co. 1 Richardson Unit, NE NE 2-27n-13w. IPF 5,587 M.c.f.d., Dakota discovery, new field. TD 6,237 ft. Morrison.

NORTH TEXAS

Baylor County: Diversa, Inc. and Hal C. Newman 1 Lilly Martin, Sec. 3114, TE&L Sur., 1 mile east of Westover. IP 175 BOPD, 14/64-in. choke, 41.5°, GOR 350:1, TP 220 psi., Caddo 4,882-92 ft.; IP 144 BOPD, 16/64-in choke, 42.8°, GOR 650:1, TP 550 psi., Mississipian 5,324-64 ft. TD 5,650 ft., PB 5,463 ft.

SOUTHWEST TEXAS

Duval County: Eicher & Lively 1-A Driscoll Estate, Block 69, Sweden Farm lots, Santa Rosalia Grant, A-476, 13½ miles west of Benadvides. IPP 16 BOPD (net), 10% water, 39°, perf. 3,149½-53½ ft., Jackson. TD 3,302 ft. New pay and extension in East Poquito Creek area.

Webb County: Skelly Oil Co. 1-D Martin, Tract 2, Reyna Pasture, J. V. Borregos Grant, 10 miles southwest of Aquilares. TD 7,303 ft. New-field discovery. IP 104 BOPD (net), 15% water, 10/64-in., 39.8°, GLR 576 cu. ft. per bbl., TP 260 psi., perf. 4,914-20 ft., Wilcox.

TEXAS GULF COAST

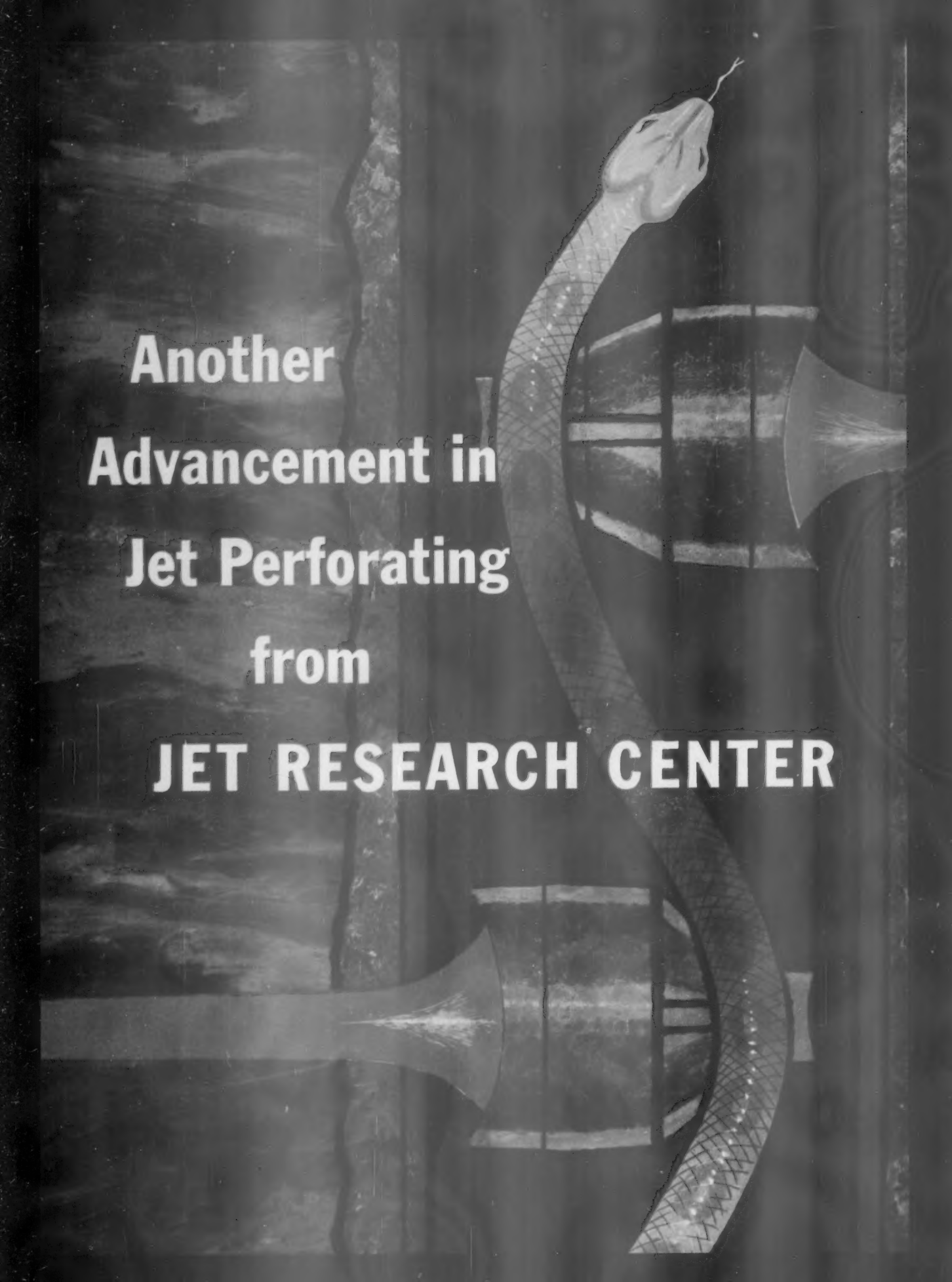
Galveston County: Humble Oil & Refining Co. 95-A Galveston Bay Tract 285, 6 miles southwest of Smith Point. IU 288 BOPD, 12/64-in., 36.4°, GOR 351 cu. ft. per barrel, TP 1,000 psi., perf. 11,406-16 ft., Frio. TD 12,780 ft. New reservoir discovery in South Red Fish Reef area.

Goliad County: Hawn Brothers et al. 1 Pereira, Pedro Trevino Sur., A-45, 7 miles southwest of Charco and 1½ miles southwest of Hordes Creek field. AOF 3,400 M.c.f.d., dry gas, shut-in TP 615 psi., perf. 1,712-20 ft., Frio. TD 5,210 ft. New-field discovery.

Harkins & Co. et al. 1 Albrecht Heirs, J. P. Wallace Sur., A-292, 13 miles northeast of Goliad. AOF 12,200 M.c.f.d., dry gas, shut-in TP 1,082 psi., perf. 2,754-59 ft., Frio. TD 9,515 ft. New-field (Rouch) discovery.

Southwestern Oil & Refining Co. 3-A Annue Dea McGlothing, Maria de Jesus Y'Barvo Grant, A-51, 9 miles northwest of Goliad. AOF 3,400 M.c.f.d., dry gas, shut-in TP 951 psi., perf. 2,561-67 ft., Frio. TD 8,444 ft. New pay in Riverdale field.

Goliad County: Southwestern Oil & Refin-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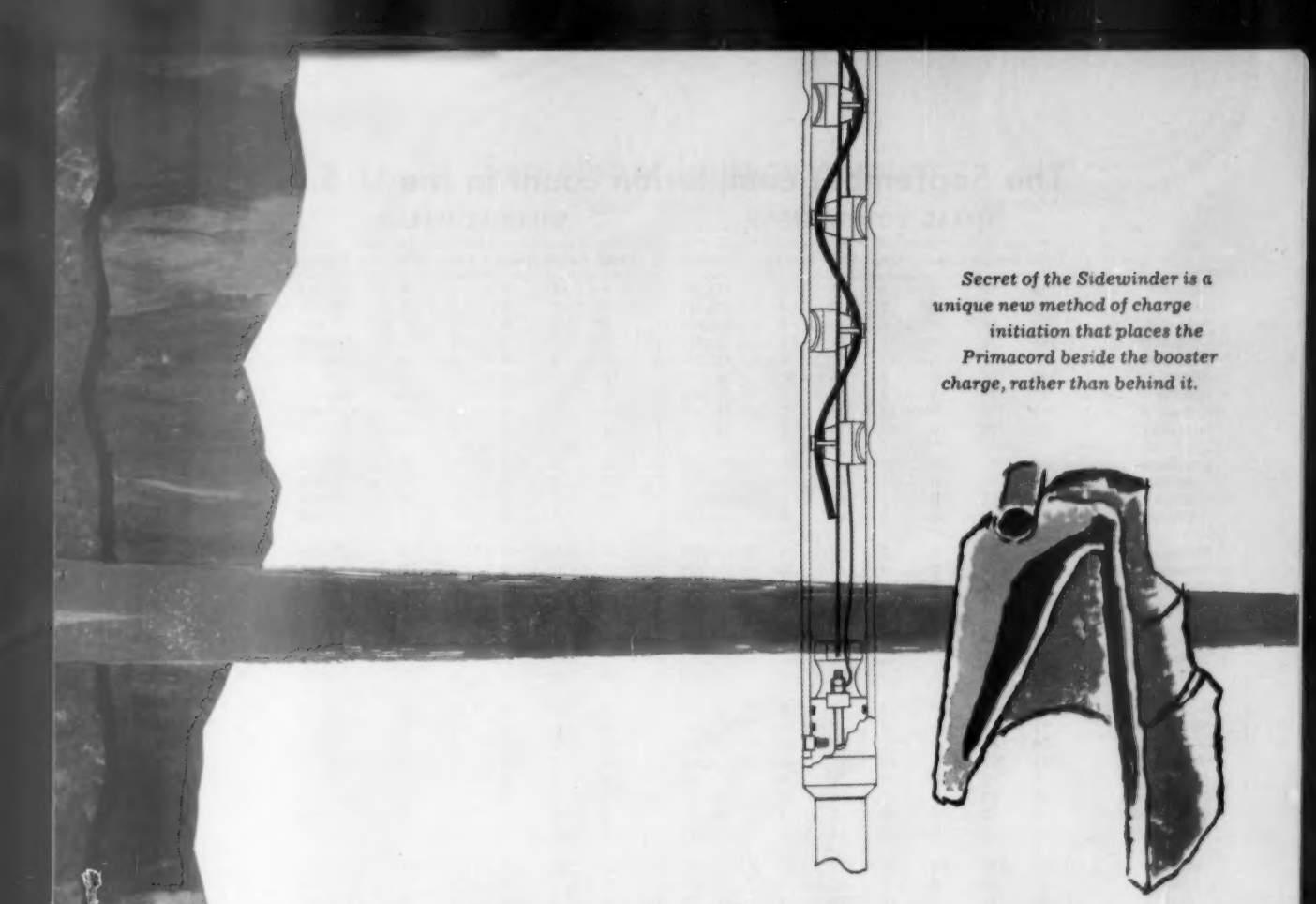

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GREATER PERFORATING POWER THROUGH RESEARCH

The September completion count in the U. S.

	TOTAL COMPLETIONS							WILDCAT WELLS							
	Total	Crude	Cond.	Gas	Dry	Service	Footage	Total	Crude	Cond.	Gas	Dry	Footage	C.T.	Act. op.
Alabama	14	10	0	0	4	0	138,550	4	0	0	0	4	29,444	0	6
Arizona	8	0	0	1	7	0	29,458	8	0	0	1	7	29,458	0	10
Arkansas	70	39	0	5	26	0	228,637	14	1	0	2	11	51,606	0	124
California	148	74	0	5	61	8	758,613	53	5	0	4	44	334,176	0	88
Colorado	77	13	0	13	51	0	423,373	43	3	0	4	36	228,584	0	140
Illinois	182	65	0	1	86	30	380,414	25	1	0	0	24	39,222	11	416
Indiana	83	26	0	0	57	0	117,400	34	6	0	0	28	49,705	61	82
Kansas	359	138	0	10	204	7	1,310,397	128	15	0	4	109	480,488	2	382
Kentucky	222	74	0	34	113	1	297,298	68	3	0	1	64	80,556	192	259
Louisiana	366	157	40	25	143	1	2,731,464	48	2	1	5	40	397,112	0	425
North	160	71	0	23	66	0	555,757	27	2	0	5	20	140,804	0	148
South	157	62	30	2	62	1	1,640,934	20	0	1	0	19	244,368	0	214
Offshore	49	24	10	0	15	0	534,773	1	0	0	0	1	11,940	0	63
Michigan	70	26	0	2	37	5	236,995	20	1	0	1	18	73,160	25	196
Mississippi	72	27	2	0	43	0	677,126	27	0	0	0	27	227,567	0	69
Montana	32	16	0	1	15	0	168,914	15	2	0	0	13	60,207	2	71
Nebraska	109	27	0	1	81	0	629,488	47	2	0	0	45	263,091	0	47
New Mexico	228	134	5	45	37	7	953,331	23	2	0	0	21	84,555	43	253
West	100	37	5	42	12	4	395,611	5	1	0	0	4	12,221	7	161
East	128	97	0	3	25	3	557,720	18	1	0	0	17	72,334	36	92
New York	19	12	0	0	0	7	24,572	0	0	0	0	0	0	19	11
North Dakota	31	18	1	0	12	0	217,245	6	1	0	0	5	32,859	0	37
Ohio	109	40	0	27	31	11	282,502	2	0	0	1	1	9,780	108	195
Oklahoma	511	217	5	46	213	30	1,949,595	94	8	2	12	72	462,477	71	657
Oregon	1	0	0	0	1	0	1,347	1	0	0	0	1	1,347	1	1
Pennsylvania	49	12	0	29	3	5	165,482	0	0	0	0	0	0	40	46
South Dakota	3	2	0	0	1	0	25,570	1	0	0	0	1	8,386	0	8
Tennessee	5	1	0	0	4	0	4,972	3	0	0	0	3	3,575	5	15
Texas	1,619	879	68	70	570	32	7,028,655	312	12	4	2	294	1,498,268	0	1,142
Dist. 1	61	26	0	2	32	1	223,939	25	0	0	0	25	115,906	0	47
Dist. 2	63	16	7	10	30	0	432,271	18	0	1	0	17	116,742	0	61
Dist. 3	99	33	12	0	54	0	696,797	26	1	1	0	24	224,899	0	88
Dist. 4	126	38	24	15	49	0	692,845	32	2	1	1	28	176,527	3	88
East	127	70	13	1	42	1	492,805	25	0	0	0	25	117,027	0	71
Dist. 7-B	230	105	2	6	114	3	710,659	69	5	0	1	63	230,785	0	69
West	487	356	2	7	112	10	2,449,430	59	1	0	0	58	284,669	36	455
Dist. 9	314	171	2	8	116	17	857,055	47	3	0	0	44	172,286	42	97
Dist. 10	112	64	6	21	21	0	472,854	11	0	1	0	10	59,427	0	166
Utah	32	20	0	1	11	0	165,728	7	0	0	0	7	39,146	0	46
Washington	1	0	0	0	1	0	8,468	1	0	0	0	1	8,468	0	2
West Virginia	76	8	0	51	11	6	186,459	6	0	0	4	2	34,541	72	201
Wyoming	92	32	1	5	45	9	447,984	34	3	0	1	30	190,020	4	157
Total Sept. 1959	**4,588**	**2,067**	**122**	**372**	**1,868**	**159**	**19,590,037**	**1,024**	**67**	**7**	**42**	**908**	**4,717,798**	**737**	**5,086**
Total Aug. 1959	4,137	2,020	94	340	1,597	86	17,625,880	887	75	7	33	772	4,391,741	683	5,192
Cumulative 1959	37,820	18,824	927	2,789	14,256	1,024	157,466,303	7,391	674	91	237	6,389	36,043,337	6,645	....
Cumulative 1958	35,740	17,557	860	2,715	13,694	914	146,724,293	7,091	696	124	204	6,067	33,154,437	....	....

Note: C. T. = Cable Tool Comp. D. D. = O.W.D.D. Act. Op. = Active Operations.
00 = 33: Ill. 1, Ky. 1, Kans. 1, Wyo. 3, Neb. 1, Mont. 1, Ohio 1, Okla. 18, Dist. 10-1, Dist. 3—2, Dist. 2—1, Dist. 4—2.

. . . and in Canada

	TOTAL WELLS							WILDCATS					
	Total	Oil	Gas	Day	Service	Footage	Cum. 1959	Total	Oil	Gas	Dry	Footage	Cum. 1959
Western Canada	**200**	**116**	**26**	**53**	**5**	**1,019,960**	**1,843**	**55**	**9**	**7**	**39**	**291,279**	**526**
Alberta	141	78	20	38	5	787,671	1,129	40	5	7	28	224,248	293
Saskatchewan	46	33	2	11	0	180,028	608	12	4	0	8	50,829	168
Manitoba	5	4	0	1	0	9,536	32	1	0	0	1	1,139	7
British Columbia	8	1	4	3	0	42,725	70	2	0	0	2	15,063	48
N.W.T.	0	0	0	0	0	0	4	0	0	0	0	0	4
Ontario	47	5	17	23	2	67,662	201	0	0	0	0	0	0

ing Co. 2 Pettus, Maria de Jesus Y'Barvo Grant, A-51, 9 miles northwest of Goliad. AOF 3,020 M.c.f.d., dry gas, shut-in TP 975 psi., perf. 2,436-40 ft., Frio. TD 8,445 ft. New pay in Riverdale field.

Jackson County: H. H. Howell et al, 1 Turner-Hanna Unit, Section 8, C. W. Hahl Subd. of Harwood Burns Ranches, John J. Linn Sur., A-213, 6 miles south of Edna. AOF 96,000 M.c.f.d., dry gas, shut-in TP 2,259 psi., perf. 5,911-13 ft., Frio and 128 M.M.c.f.d., dry gas, shut-in pressure 2,106 psi., perf. 5,492-97 ft., Frio. TD 7,012 ft. New-field discovery.

Jefferson County: Shell Oil Co. 37 McFaddin Trust, Sarah A. Pace Sur., A-783, 12 miles west of Sabine Pass. IP 97 BOPD, 8/64-in., 40°, GOR 1,216 cu. ft. per barrel, TP 775 psi., perf. 6,350-55 ft., Miocene, and 95 BOPD, 6/64-in., 35°, GOR 800 cu. ft. per barrel, TP 1,200 psi., perf. 6,029-34 ft., Mio-

September footage account

	FIELD WELLS					WILDCAT WELLS			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	109,106	.....	.....	.....	.....	.....	.....	.....	29,444
Arizona	.....	.....	.....	.....	.....	.....	.....	6,645	22,813
Arkansas	112,845	.....	11,473	52,713	.....	4,756	.....	13,393	33,457
California	315,783	.....	2,550	75,435	30,669	41,724	.....	24,093	268,359
Colorado	53,362	.....	56,322	85,105	.....	14,190	.....	20,751	193,643
Illinois	153,283	.....	909	132,601	54,399	1,445	.....	.....	37,777
Indiana	26,908	.....	.....	40,787	.....	8,702	.....	.....	41,003
Kansas	448,132	.....	33,778	325,697	22,302	64,841	.....	22,118	393,529
Kentucky	65,702	.....	85,728	64,656	656	4,975	.....	1,109	74,472
Louisiana	1,004,799	507,394	105,869	703,005	13,285	8,116	12,091	43,561	333,344
North	188,464	.....	79,033	147,456	.....	8,116	.....	43,561	89,127
South	570,095	375,504	26,836	410,846	13,285	.....	12,091	.....	232,277
Offshore	246,240	131,890	.....	144,703	.....	.....	.....	.....	11,940
Michigan	79,330	.....	3,930	65,918	14,657	4,222	.....	2,525	66,413
Mississippi	278,029	22,341	.....	149,189	.....	.....	.....	.....	227,567
Montana	92,342	.....	2,531	13,834	.....	7,397	.....	.....	52,810
Nebraska	141,118	.....	5,225	220,054	.....	11,985	.....	.....	251,106
New Mexico	545,088	34,370	199,578	61,855	27,885	5,753	.....	.....	78,802
West	107,074	34,370	191,829	30,437	19,680	2,123	.....	.....	10,098
East	438,014	.....	7,749	31,418	8,205	3,630	.....	.....	68,704
New York	15,252	.....	.....	.....	9,320	.....	.....	.....	.....
North Dakota	126,620	11,622	.....	46,144	.....	3,503	.....	.....	29,356
Ohio	114,285	.....	70,241	55,484	32,712	.....	.....	3,170	6,610
Oklahoma	787,172	30,990	191,877	415,649	61,430	63,818	20,518	73,963	304,178
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	1,347
Pennsylvania	22,106	.....	127,452	9,674	6,250	.....	.....	.....	.....
South Dakota	17,184	.....	.....	.....	.....	.....	.....	.....	8,386
Tennessee	697	.....	.....	700	.....	.....	.....	.....	3,575
Texas	3,553,993	480,572	280,206	1,143,363	72,253	47,763	33,776	12,035	1,404,694
Dist. 1	73,608	.....	13,585	18,710	2,130	.....	.....	.....	115,906
Dist. 2	115,144	48,600	51,573	100,212	.....	.....	10,620	.....	106,122
Dist. 3	165,094	120,562	.....	186,242	.....	7,256	10,990	.....	206,653
Dist. 4	181,206	155,396	72,920	106,796	.....	9,197	5,166	10,500	151,664
East	214,892	81,875	1,878	72,473	4,660	.....	.....	.....	117,027
Dist. 7-B	301,846	8,322	15,215	146,862	7,629	14,970	.....	1,535	214,280
West	1,803,258	17,767	14,400	305,183	24,153	4,303	.....	.....	280,366
Dist. 9	434,180	12,345	39,216	165,347	33,681	12,037	.....	.....	160,249
Dist. 10	264,765	35,705	71,419	41,538	.....	.....	7,000	.....	52,427
Utah	108,871	.....	4,860	12,851	.....	.....	.....	.....	39,146
Washington	.....	.....	.....	.....	.....	.....	.....	.....	8,468
West Virginia	17,118	.....	107,453	16,051	11,296	.....	.....	17,579	16,962
Wyoming	157,048	7,600	27,341	59,775	6,200	20,332	.....	4,897	164,791
Total U. S.	**8,346,173**	**1,094,889**	**1,317,323**	**3,750,540**	**363,314**	**313,522**	**66,385**	**245,839**	**4,092,052**
Western Canada	560,714	.....	64,272	77,132	26,563	47,313	.....	40,245	203,721
Alberta	433,949	.....	41,430	61,481	26,563	30,527	.....	40,245	153,476
Saskatchewan	113,958	.....	3,117	12,124	.....	16,786	.....	.....	34,043
Manitoba	8,397	.....	.....	.....	.....	.....	.....	.....	1,139
British Columbia	4,410	.....	19,725	3,527	.....	.....	.....	.....	15,063

cene. TD 6,587 ft. New pays in Clam Lake field.

Kleberg County: Northern Pump Co. and Arkansas Fuel Oil Corp. 1 R. J. Kleberg, Jr., Lot 12, Section 40, Kreberg Town & Improvement Co. Subd., 10 miles southeast of Kingville. AOF 4,750 M.c.f.d., dry gas, shut-in TP 2,627 psi., perf. 7,214½-15½ ft., Frio. TD 8,350 ft. New pay in Ricardo field.

Humble Oil & Refining Co. 14 King Ranch Alazan, Las Comitas Grant, A-231. IP 125 BOPD (net), 31% water, 3/16-in., 47.7°, GOR 935 cu. ft. per barrel, TP 500 psi., perf. 6,060-65 ft., Frio. TD 10,068 ft. New pay in North Alazan field.

Lavaca County: Miller & Fox Minerals Corp., 1 R. A. Williams, I. G. Gregory Sur., A-701, 5 miles southeast of Hope. AOF 14 M.M.c.f.d., GLR 34.3 M.c.f. per barrel, 50.4°, shut-in TP 2,717 psi., perf. 7,837-41 ft., Wilcox. TD 8,050 ft. New-field discovery.

North Central Oil Corp. 1 W. L. Sartwelle et al, James Frazier Sur., A-171, 7 miles southeast of Ezzell. AOF 20,500 M.c.f.d., dry gas, shut-in TP 1,376 psi., perf., 3,310-14 ft., Frio. TD 9,140 ft. Discovery well Southwest Speaks field.

Nueces County: Blanco Oil Co. and Layton Brown Drilling Co., Inc., 1 State, Tract 384, Corpus Christi Bay, 3 miles southwest of Port Aransas. AOF 12,400 M.c.f.d., GLR 221 M.c.f. per bbl., 44.2°, shut-in TP 3,385 psi., perf. 8,233-37 ft., Frio, and 31,200 M.c.f.d., GLR 77.2 M.c.f. per bbl., 59.7°, shut-in TP 2,748 psi., perf. 7,439-44 ft., Frio. TD 9,020 ft. New-field discovery.

Refugio County: T-C Oil Co. 20-H O'Connor, John Keating Sur., A-40, 20 miles north of Refugio. AOF 36,500 M.c.f.d., dry gas, shut-in TP 1,588 psi., perf. 3,980-85 ft., Catahoula. TD 6,681 ft. New pay in Huff area.

San Patricio County: Northern Pump Co. and Farenthold & Pitcairn 1 Timon Unit, San Patricio de Hibernia Town Tract 122, 6 miles southeast of Mathis. IP 122 BOPD, 9/64-in., 36.4°, GOR 594 cu. ft. per bbl., TP 725 psi., perf. 5,455-58 ft., Frio, and 82 BOPD, 28°, GOR 6,480 cu. ft. per barrel, 1,325 psi., perf. 4,463-65 ft., Frio. TD 5,800 ft. New pays in Hibernia field.

Engeo Oil & Gas Co. 4-B J. W. Mayo, J. Fessenden Sur., A-119, 5 miles northeast of Taft. IP 160 BOPD, P-39 choke, 41°, GOR 1,270 cu. ft. per bbl., TP 950 psi., perf. 6,764-68 ft., Frio, and 151 BOPD, P-41 choke, 36.4°, GOR 925 cu. ft. per barrel, 450 psi., perf. 6,046-50 ft., Frio. TD 6,829 ft. New pays in Taft field.

Victoria County: George Parker 1 Alfred Friar, Section 17, SA&MG Sur., A-327, 15 miles north of Victoria and 3,375 ft. southwest of Southwest Helen Gohlke field. AOF 25,600 M.c.f.d., GLR 49.7 M.c.f. per bbl., 52.2°, shut-in TP 3,035 psi., perf. 8,504-12 ft., Wilcox. TD 8,615 ft. New reservoir

(Continued on page 161)

W. L. LAMBERT, who kicked off the present Green County, Kentucky, boom, watches a workman at one of his wells.

Faith Paid Off for Lambert

. . . in Kentucky's Green County play. After pumping salt water for 3 months, his No. 1 Meadows started the boom.

W. L. LAMBERT is an oil man who doesn't know how to retire. He has tried it off and on for years, but it never quite took. The last time he came back into the business, he touched off the Green County play in central Kentucky.

No one has ever dubbed him the king of the wildcatters. He isn't to be ranked with the great rich since he's too generous with his money. But he does lay claim to fame as the second oldest practicing oil man in the industry. With 62 years of experience, he might preempt the top spot. The fact that he doesn't reveals his conservative attitude on overstatement.

Lambert got a head start on many oil men by being the son of an oil man. Isaac Lambert operated near Sistersville, W. Va., at the close of the century. During a particularly pesky fishing job one winter, he let his son take off from school for 2 months to cut firewood for his boilers. For this, he gave him an interest.

This didn't exactly launch W.L. into a fortune in oil. He had to launch himself some years later. His success in finding oil stems from an early ability to recognize opportunity in rather obscure guise, smallpox for example. The lease play was active around Sistersville and W.L. had his eye on a $100 package. But his drugstore job paying $1 a week plus board permitted little capital accumulation.

Then a smallpox epidemic swept through West Virginia. With a borrowed horse and medical kit, he headed for the hills and vaccinated everyone who would stand still long enough. With the net result of $70 and his pocket watch, he acquired the lease and sold it shortly after for "about $600 or $700," he recalls.

Following this auspicious start he brought in his first producer at the age of 17. Then he proceeded to drill eight dry holes in a row. This marked his first retirement from the business.

But not for long. He reentered the business and followed oil from West Virginia to Kentucky, Oklahoma, Kansas, Texas, and Arkansas. During these plays, he branched out on occasion, buying stores and real estate, to improve and sell at a profit. His real-estate ventures resulted in two towns named Lamberton, one in West Virginia and one in Arkansas.

Starts boom . . . Lambert returned to Kentucky in 1930 and settled in Louisville. His latest venture in Green County he rates as his most satisfying from a personal standpoint. Green County was not virgin oil country. A number of 35-year-old wells had been drilled and abandoned around Greensburg.

When a group of residents approached him, he made up his mind to come out of retirement once more.

▶▶▶ Personals

Oliver M. Fletcher, engineer with Texas Eastern Transmission Corp. at Shreveport, La., has been named acting assistant supervisor of design and construction in the company's engineering department.

Maurice N. Day, assistant to the engineer of Michigan Consolidated Gas Co., has been appointed assistant chief engineer of Michigan Wisconsin Pipe Line Co. and American Louisiana Pipe Line Co. The companies are subsidiaries of American Natural Gas Co.

John Peake, formerly proration engineer with Canada-Cities Service Petroleum Corp., has joined Mitchell & Associates, Ltd., geological and petroleum engineering consulting firm, as senior associate. He will headquarter in Edmonton.

Harry E. Bangert, Tulsa division exploration manager for Aurora Gasoline Co., has been transferred to Detroit in Aurora's marketing and refining division. Bangert has been with Aurora since 1948. Before that time he had been assistant to the president of the old Mid-West Refineries, Inc., sales manager of the old Roosevelt Oil & Refining Corp., and had headed an independent marketing firm.

Raymond A. Semrad has been named manager of Sinclair Oil & Gas Co.'s new data-processing department. Semrad has been with Sinclair's economics department since 1953.

Edward A. Koester, formerly geological consultant in Wichita, has established offices in Denver. He will specialize in the Rocky Mountain and Mid-Continent regions. Koester is a past president of American Association of Petroleum Geologists.

In 2 days he was ready to drill. The first well, No. 1 Hattie Meadows, south of Greensburg, came in making 100% salt water. It had an odor of oil, but that was all it had. Lambert, however, knew the pecularities of the "blue sand" lying at 500 ft. He put it on the pump and proceeded to drill the second and third wells. Neither had more than an odor of oil but Lambert started pumping salt water.

After 3 months, No. 1 started making some oil. The others came through in several weeks. Meanwhile, No. 4 Meadows was completed initially for 200 bbl. of oil plus a lot of salt water. The boom was on. But it took an old-timer to foresee that a well in that country could start making oil only after a lot of salt water had been "pumped off."

In return, Greensburg has been good to Lambert. Today he and his son Carol are proceeding in a typically leisurely fashion to drill up their acreage.

Lambert can't recall offhand how many wells he has, or how many he will drill. He's devoting more attention to doing some good with the money he can't take with him. A number of less fortunate friends around Kentucky have found themselves the recipients of lifetime interests in producing properties, which will eventually pass on to others. A children's clinic in Louisville is buying new equipment with Lambert money from Green County.

Greensburg people associate Lambert wells with picnics. W.L. likes to mark each well completion with an all-out buffet, catered from Louisville. From all indications, a good many more of these picnics are in prospect.

If Lambert decides to "retire" again, the odds will probably rise on other picnics in other new producing areas. After 62 years, finding new oil becomes a habit.

S. A. Ballard, director of chemical research at Shell Development Co.'s Emeryville, Calif., research center, has been given a leave of absence to become research coordinator of chemicals for Bataafse Internationale Chemie Mij., N. V. He will headquarter in The Hague.

Stanley D. Breitweiser, executive vice president of DX Sunray Oil Co., and **M. Darwin Kirk,** vice president and general counsel of Sunray Mid-Continent Oil Co., have been elected directors of Sunray Mid-Continent. They succeed **Edward Howell** and **E. M. Rouzer,** who have retired.

William H. Miller, assistant general manager of marketing for Standard Oil Co. (Ind.), has been named general manager of sales and a director of the company. He succeeds **Alton C. Sailstad,** who has resigned. Miller has been with Indiana Standard since 1929.

Ira Needham, Jr., formerly on special assignment in Pure Oil Co.'s Chicago general offices, has been appointed acting manager of the Rocky Mountain producing division. He will headquarter in Denver. Needham succeeds **Harris Van Zandt,** who was recently named general manager of production operations for the company.

George D. Watson has been named shift foreman, reforming and cracking, at Tidewater Oil Co.'s Avon refinery, Associated, Calif. He succeeds **T. J. Vacchieri,** who has retired after 38 years with the company. **Clifford A. Torbet,** operating foreman in lube crude and blending, has been named operating foreman, solvent treating and light-oil treating. **Kenneth H. Bisordi** will succeed Torbet. **M. S. Stokely, Jr.,** has been named machinery inspector. **D. H. Emanuelson** will succeed Stokely as area engineer.

Atlantic Refining Co. has named personnel for its new Mid-Continent region which will take over combined operations of the Dallas-eastern region and Oklahoma-Kansas region January 1. **H. C. Harris, Jr.,** now manager of Dallas-eastern region, will be Mid-Continent regional manager (OGJ, Oct. 5, p. 246). New appointment for **A. B. Macaulay,** now Oklahoma-Kansas region manager, will be announced later. **Charles W. Alcock,** Oklahoma-Kansas exploration manager, and **Gordon T. Lepley, Jr.,** Dallas-eastern operations manager, will continue in the same posts in the new region. **Alan D. Knox,** district landman in West Texas, will be regional land manager. **Van D. Robinson,** exploration manager in the Dallas-eastern region, has been named regional geologist. **Jesse P. Johnson,** Oklahoma-Kansas operations manager, will be regional production superintendent. **J. H. Sullivan,** Dallas-eastern petroleum engineer, and **James E. Lloyd,** Dallas-eastern drilling manager, will continue in the same posts in the new region. Atlantic's Jackson, Miss., district office, formerly in Dallas-eastern region, has been added to the south Louisiana region, Lafayette, La. **Tom C. Frick** will continue as manager of this region, which has been renamed the eastern Gulf Coast region.

▶▶▶ Personals

Charles H. Porch, assistant to the marketing vice president of Signal Oil & Gas Co., has been named manager of marketing divisions. He will be in charge of Signal's Hancock, Norwalk, and Eastern States divisions.

F. E. Wellings, chief geologist and general manager of production operations for Iraq Petroleum Co., Ltd., will retire this year after 30 years of service. He has spent 21 years in the Middle East and the past 9 years in London.

Seymour W. Ferris, section chief for industrial products in Sun Oil Co.'s product development department, has been appointed a research associate in research and development. He was succeeded by **Ivor W. Mills,** formerly group leader.

William H. Price has been elected a vice president of Cities Service Petroleum, Inc., and will serve as executive assistant to **A. P. Frame,** senior vice president of the parent Cities Service Co. Price was formerly a staff executive in the manufacturing department. He is a director of Cities Service Refining Corp., Cities Service Research & Development Co., Petroleum Chemicals, Inc., and Cities Service Refining (Canada), Ltd.

John F. Richardson, head of the petroleum engineering section in Carter Oil Co.'s Tulsa headquarters, has been named district engineer in Seminole, Okla. **Joe T. Taylor,** formerly Seminole district engineer, has been transferred to Purcell, Okla., as district engineer. He succeeded **K. H. Larsen,** now on temporary assignment with Jersey Production Research Co., an affiliate, in Tulsa. Richardson will be succeeded in Tulsa by **Gerald R. Gilbert.**

Charles T. Draney has been elected vice president and a director of Bechtel International Corp. and managing director of Bechtel International, Ltd. He will continue as a vice president of Bechtel Corp., the parent company. He will headquarter in San Francisco. **Russell G. Johnson,** chief engineer for Bechtel's refinery and chemical division, has been elected a vice president of Bechtel International, Ltd. He will headquarter in London as manager of engineering in Europe. **Leonard W. Breidenstein,** assistant chief engineer, refinery and chemical division, will succeed Johnson as division chief engineer.

▶▶▶ Personals

Don H. Miller, Kansas City, general manager of Skelly Oil Co.'s marketing department, has been elected president of the company. (See Newsletter) Miller has spent his entire business career with Skelly in marketing and sales since graduation from the University of Missouri in 1932. He succeeds **John S. Freeman,** who resigned as president and a director

MILLER

FREEMAN

after 36 years with the Skelly organization. Freeman had been president since 1957 when the late William G. Skelly, founder of the company, became chairman. Skelly's son-in-law, **Harold C. Stuart,** Tulsa attorney and radio-television executive, was elected a director succeeding Freeman. Miller joined Skelly in Kansas City and has held regional sales posts in Chicago, Madison, Wis., Springfield, Ill., and Omaha. He has been in the Kansas City office since 1945. Miller will replace **Jess Knowles,** vice president of marketing, on the Skelly board. Knowles will continue as a Skelly vice president.

William F. Prescher, geologist in Casper, Wyo., for Sun Oil Co., has been named district geologist there. **M. S. Tudor,** geologist, has been named senior geologist in Bismarck, N. D.

William Martin, division engineer in Northern Natural Gas Co.'s Permian region, has been promoted to supervisor of construction in Midland, Tex. Also **Kenneth Wetterberg,** engineer in technical services, has been named supervisor of engineering planning.

Earl J. Davis, Denver district manager for Dowell division of Dow Chemical Co., has been named manager of Dowell's Houston district. He succeeds **Jack Talbot,** who has been transferred to Cleveland. **Jack Sutherlin,** Wichita Falls, Tex., district manager, has succeeded Davis in Denver. The Wichita Falls office will be closed and its operations will be handled by Oklahoma City and Midland, Tex., districts.

Earl J. Cox, formerly a consultant, has joined the South Dakota Geological Survey in Vermillion as a petroleum geologist.

William F. Spoede, formerly with Pure Oil Co. in Nederland, Tex., has joined the engineering department of Monsanto Chemical Co.'s plastics division plant in Texas City.

William J. Ainsworth, junior exploitation engineer with Shell Oil Co., has been transferred to Houston from Lafayette, La.

Norman C. Schumacher, sales engineer in petroleum additives for Amoco Chemicals Corp., has been appointed sales supervisor, petroleum additives.

W. J. McBride, formerly geologist with Humble Oil & Refining Co. in Wichita Falls, Tex., has joined D. R. McCord & Associates, Dallas consulting firm. He will be in charge of domestic geological evaluation.

W. H. Hammond, formerly vice president of Ralph E. Fair, Inc., has joined Texstar Petroleum Co. division of Texstar Corp. as petroleum geologist and manager of exploration activities. Hammond was with Magnolia Petroleum Co. before joining the Fair company.

Darrel C. Rigdon, connection foreman for Cherokee Pipe Line Co. in Drumright, Okla., has been transferred to Badger Pipe Line Co. in Rockford, Ill., as maintenance foreman. The companies are affiliates of Cities Service Oil Co.

H. J. Thomas, formerly assistant superintendent of Shell Chemical Corp.'s Martinez, Calif., plant, has moved up to plant manager. He succeeds **E. W. Casagrande,** who was named manager of the Dominguez, Calif., plant.

Calvin D. Saunders has been promoted from group leader of the fracturing section at Halliburton Oil Well Cementing Co.'s Duncan, Okla., chemical research and development laboratory, to assistant laboratory manager. **W. T. Malone** will succeed Saunders as group leader. **Wayne Hower,** organic section leader at the laboratory, has been named research associate, a new position. The former organic section has been divided into two new sections, chemical well stimulation, headed by **John Knox,** and water and sand control, headed by **Joe Ramos.**

Fred W. Ayers has retired as senior vice president and general manager of Hughes Tool Co. and will become vice chairman of the board, a new position. **Maynard E. Montrose,** vice president in charge of sales, will succeed Ayers, and **W. H. Siems,** general sales manager, has been named vice president succeeding Montrose.

AYERS

MONTROSE

SIEMS

Ayers had been with the Austin and Daimler companies in England and with DuPont and General Motors in the U. S. before joining Hughes Tool in 1943. Montrose was with General Electric Co., Lane-Wells Co., and Marion Power Shovel Co. before joining Hughes. Ayers has been Hughes senior vice president since 1945, and Montrose had held the sales post since 1948. Seims was named Hughes general sales manager in 1950. He was export manager for the firm before that time.

Ralph T. McElvenny, president of Michigan Consolidated Gas Co., has been elected a director of the American Gas Association.

I. M. Glasser, supervising petroleum engineer in Corpus Christi, Tex., for Humble Oil & Refining Co., has been transferred to Pleasanton, Tex., as district supervising engineer.

Wayne M. Dowden has been named a research engineer in Continental Oil Co.'s production research division. He was formerly with Shell Oil Co. and Ohio Oil Co.

Robert B. Stobaugh, Jr., formerly project engineer with California Texas Oil Co., Ltd., has joined Monsanto Chemical Co.'s plastics division engineering department at Texas City.

John J. Magee, exploration representative in Lisbon for Mobil Exploration Portugal, Inc., has been transferred to the exploration staff of Mobil Oil Francaise. He will headquarter in Paris.

Personals

A. W. Downs, geologist with Texas Gulf Producing Co., has been transferred to Midland, Tex., from Salt Lake City.

Glenn A. McQuate, junior geologist in Houston for Shell Oil Co., has been promoted to geologist and transferred to Pittsburgh.

T. G. Wise, a director of Husky Oil Co. and president of its subsidiary, Husky Hi-Power, Inc., has been elected vice president, marketing and refining, for the parent company.

Dr. K. Keith Okamoto, formerly with California Research Corp. in Richmond, Calif., has joined the research department of Monsanto Chemical Co.'s plastics division in Texas City.

Reinhard S. Wobus, Belleville, Ill., former technical production manager for Monsanto Chemical Co.'s organic chemicals division, has taken over the newly created post of product director for petroleum chemicals and functional fluids.

E. A. Komma, compressor station superintendent for Cities Service Gas Co. in Mooreland, Okla., has been named superintendent of the Ulysses, Kans., station. **Leon Brinkmeyer,** engineer at the Hugoton compressor station, Satanta, Kans., will succeed Komma at Mooreland. Also, **Aubrey Summers,** production engineer in Medicine Lodge, Kans., has been named pipeline foreman in the Kansas City division.

Philip H. Jennings, formerly chief geologist in Magnolia Petroleum Co.'s exploration department, has been named Houston division geologist for Mobil Oil Co. **D. V. Carter,** formerly chief petroleum engineer for Magnolia's producing department, has been named Houston division engineer. Houston is one of four division

JENNINGS

CARTER

exploration and production offices of the new Mobil Oil. Others are in Midland, Tex., Denver, and Los Angeles. Several other Magnolia executives have been named to posts in the Houston and Midland offices. In Houston, **J. A. Lester,** assistant chief geophysicist in Magnolia's geophysical department, has been named division geophysicist. **Marvin S. Jones,** assistant superintendent in Magnolia's land department, has been named division land man. **Stuart Mossom,** formerly coordinator of offshore operations and producing property purchases for Magnolia, will be in charge of division joint interest. **K. R. Joynt,** formerly Gulf Coast producing division superintendent for Magnolia, becomes division operations superintendent. In the Midland office, **Joseph Neely,** Magnolia assistant chief geologist, has been appointed division geologist. **John T. Jones,** formerly with Mobil Producing Co., will be division land man. **George W. Isensee,** Magnolia area geophysicist in Houston, will be Midland division geophysicist. **C. H. Hudson,** formerly assistant chief petroleum engineer in Magnolia's producing department, has been named Midland division engineer. **J. S. Russell,** assistant Gulf Coast producing division superintendent, will be division operations superintendent, and **Fred S. Wright, Jr.,** assistant general manager of Magnolia's part-interest operations, will be in charge of division joint interest.

Russell B. Hodgson, joint venture representative for Tidewater Oil Co.'s western division production department, has received the meritorious service award of California coastal chapter of API's Division of Production. The award recognizes leadership and service to the chapter.

S. Russell Casey is president of Pat Casey & Associates, newly organized Houston oil and gas-operating company. Other officers are **Dudley Sharp, Jr.,** vice president; **Loren E. Brown,** also vice president; and **Heber Stone,** secretary and land department manager. The company will operate properties on a fee basis and manage funds for testing and developing oil and gas leases in the Western Hemisphere.

Deaths

William A. Thayer, 89, pioneer oil man who entered the industry in the 1880's, died recently at his home in Wichita. Thayer was active in Pennsylvania, Ohio, Illinois, Oklahoma, Texas, and Kansas fields. He headed Thayer Drilling Co., Wichita, until his retirement in 1940. He was a member of a pioneer oil family. His father worked on a well drilled by Col. Edwin Drake shortly after Drake's famous first well came in.

James Casheen, former general sales manager for Pan American Petroleum & Transport Corp., New York City, died October 20 in Tuckahoe, N. Y.

Sumner B. Sargent, 58, president of Sargent Engineering Corp., Huntington Park, Calif., died October 18. He suffered a heart attack while hunting with friends near Big Piney, Wyo.

James R. Gahan, 71, retired assistant to the executive vice president of Tidewater Oil Co. in Houston, died October 18 at his home after a long illness. A graduate of Allegheny College, Meadville, Pa., Gahan joined Tidewater in 1920. He had been executive manager in Tampico, Mexico, and Fort Worth manager before moving to Houston in 1923. He retired in 1953.

John Elwood Carson, 84, chief engineer for the old Marland Oil Co., died October 13 in Winfield, Kans.

Wayne Warren Slocum, 34, president of Mercury Oil Field Transportation Co., Oklahoma City, and **John W. Gentry,** 36, of Mercury, were killed October 15 in a pipeline construction job accident near Kingman, Kans. Slocum had headed Mercury since 1956.

Adam H. Black, 86, retired president of Black, Sivalls, and Bryson, Inc., died October 20 in a Kansas City hospital. He had been ill for several years. A pioneer manufacturer of oilfield equipment, Black entered the industry in 1892 in Ohio making wooden tanks for crude-oil storage. He retired in 1946 as president of the manufacturing firm.

Harry R. Miller, 53, labor relations manager for Standard Oil Co. of California, died recently of a heart attack while on a business trip to Perth Amboy, N. J. He had been with Indiana Standard since 1927.

John S. Underwood, 67, retired supervisor of stores for Standard Oil Co. of California, died October 13 in San Francisco. Underwood had been with California Standard 33 years. He retired last year.

Big drop in product stocks is coming

BY JOHN C. CASPER

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,870,170	UP	26,670	DOWN	34,755
Crude stocks	250,923,000	DOWN	326,000	DOWN	1,362,000
Completions	918	DOWN	70	DOWN	113
Refinery runs	7,759,000	UP	71,000	UP	146,000
Gasoline stocks	178,732,000	UP	1,119,000	UP	8,371,000
Kerosine stocks	33,440,000	UP	626,000	UP	1,920,000
Distillate stocks	179,990,000	UP	2,300,000	UP	18,649,000
Residual stocks	59,599,000	UP	559,000	DOWN	8,421,000
Four-product stocks	451,761,000	UP	4,604,000	UP	20,519,000
Total imports	1,450,400	UP	115,300	DOWN	69,900

LIMITATIONS on crude production may tend to restrict refinery runs in the fourth quarter and set the stage for larger-than-normal product-stock reductions.

Production allowables and contractual obligations have set crude production for the month of October at about 6,875,000 bbl. daily. The 9 producing days in Texas for a 30-day month plus new production will raise the daily average for that state in November. Increases in other areas probably will raise total production for the month to about 7,150,000 bbl. daily. If production climbs to 7,450,000 bbl. daily for December, the average for the entire fourth quarter will be about 7,160,000 bbl. daily.

Crude stocks declined steadily in the third quarter and were down to about 251,000,000 bbl. at the start of the fourth quarter. Since this total is in line with normal stock levels, there is little need for further reduction in crude stocks during the last quarter.

If there is no important drop in crude stocks in the fourth quarter, refinery runs will be limited by crude production and imports. Since there is a ceiling on imports except for receipts from Canada, the average for the quarter may be about 1,000,000 bbl. daily. With production averaging about 7,160,000 bbl. daily, total new crude would amount to about 8,160,000 bbl. daily. After allowing for crude losses, refinery runs would average near 8,140,000 bbl. daily.

The limitation on refinery runs will produce changes in product stocks according to variations in demand.

Gasoline stocks at the end of September were slightly higher than last year. To end the year with gasoline stocks at 185,000,000 bbl., means holding fourth-quarter additions to 9,000,000 bbl.

Back in 1956, gasoline inventories at the end of the year represented a jump of almost 22,000,000 bbl. over the previous year. The industry has not had a year-end total as low as 185,000,000 bbl. since that time. This may be the year.

The drop in kerosine inventories, for the fourth quarter this year, will be about in line with last year. Stocks were about a million barrels above last year at the end of September. This same differential will show at the end of the year.

Refiners need an all-time record drop in distillate inventories in the last 3 months this year if stocks are to be down to a reasonable level at the end of the year.

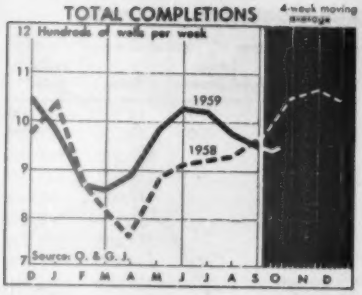
The table shows distillate stocks and fourth-quarter stocks changes since 1953. Note that stocks were gradually climbing until the big jump in 1957. The 173,000,000 bbl. reported for September that year was at least 20,000,000 higher than necessary. The total is back up to the 1957 level again this year, and a record reduction of almost 33,000,000 bbl. in the fourth quarter still will leave a good backlog to cover needed withdrawals in the first quarter of 1960.

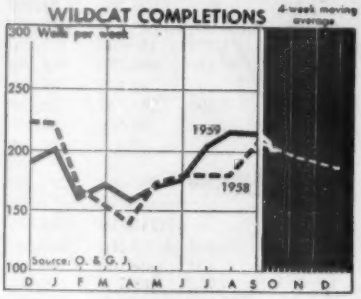
Residual stocks East of California are a little low. A drawdown of more than 7,000,000 bbl. in the fourth quarter would cut the reserve for the winter period after the first of the year.

STOCKS AND STOCK CHANGES
(Thousands of barrels)

	Stocks Sept. 30	4th Quarter change Thous. bbl.	4th Quarter change Daily avg.	Stocks Dec. 31
GASOLINE				
1953	141,902	15,970	174	157,872
1954	150,916	4,484	49	155,400
1955	150,194	15,239	166	165,433
1956	177,974	9,297	101	187,271
1957	180,688	16,088	175	196,776
1958	175,337	11,423	124	186,760
1959*	**176,000**	**9,000**	**98**	**185,000**
KEROSINE				
1953	36,776	—8,092	— 88	28,684
1954	37,099	—9,273	—101	27,826
1955	36,361	—9,591	—104	26,770
1956	33,588	—2,168	— 24	31,420
1957	36,382	—7,182	— 78	29,200
1958	31,259	—5,219	— 57	26,040
1959*	**32,200**	**—5,200**	**— 57**	**27,000**
DISTILLATE				
1953	126,361	—14,620	—159	111,741
1954	128,061	—19,917	—217	108,144
1955	143,248	—31,915	—347	111,333
1956	150,411	—16,430	—179	133,981
1957	173,269	—23,820	—259	149,449
1958	155,412	—30,311	—330	125,101
1959*	**173,900**	**—32,900**	**—358**	**141,000**
RESIDUAL				
1953	50,516	—1,146	—13	49,370
1954	56,702	—4,597	—50	52,105
1955	46,267	—7,093	—77	39,174
1956	47,342	—2,851	—31	44,491
1957	58,727	+1,232	+13	59,959
1958	67,670	—8,162	—89	59,508
1959*	**59,500**	**—8,500**	**—92**	**51,000**
RESIDUAL (EAST OF CALIFORNIA)				
1953	30,183	—1,862	—20	28,321
1954	27,804	—5,128	—56	22,676
1955	31,293	—3,929	—43	27,364
1956	31,674	— 262	— 3	31,412
1957	35,643	—2,292	—25	33,351
1958	34,040	—6,624	—72	27,416
1959*	**33,000**	**—7,000**	**—76**	**26,000**

*Fourth quarter reductions based on workable stock levels at the end of December. East-of-California residual stocks may be a little low at the end of the year.





Active Rotary Rigs

	10-19-59	10-12-59	10-20-58
Alabama	5	6	11
Arkansas	14	15	24
Arizona	1	1	2
California	101	83	71
Land	96	77	(*)
Offshore	5	6	(*)
Colorado	54	57	37
Florida	3	3	1
Land	2	2	1
Offshore	1	1	0
Illinois	35	41	60
Indiana	8	10	10
Iowa	0	0	3
Kansas	134	126	142
Kentucky	11	12	7
Louisiana	328	329	296
North	43	50	36
S. Inland waters	104	108	(†)
S. Land	123	113	227
Offshore	58	58	33
Maryland	0	0	1
Michigan	37	36	13
Mississippi	74	73	58
Missouri	0	0	1
Montana	21	25	28
Nebraska	22	25	24
New Mexico	108	113	99
New York	0	0	2
North Dakota	15	23	32
Ohio	6	5	2
Oklahoma	210	193	233
Oregon	0	0	0
Pennsylvania	12	12	8
South Dakota	8	8	1
Texas	693	717	745
S. Inland waters	1	3	(†)
S. Land	184	190	165
Offshore	2	0	0
North-East	174	175	166
West Central	189	204	249
West	143	145	165
Utah	29	31	41
Washington	2	2	0
West Virginia	7	7	3
Wyoming	89	88	63
Total U. S.	2,028	2,042	2,018
Western Canada	181	184	140
Eastern Canada	1	1	3
Grand total	2,210	2,227	2,161

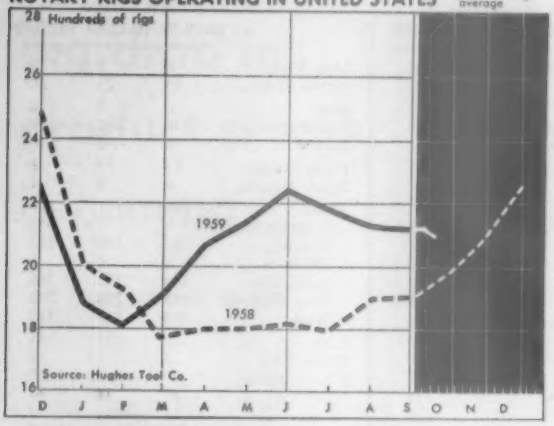
Hughes Tool Co. report. *Comparisons not available due to change in method of reporting. †Included in South-Land.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 17, 1959

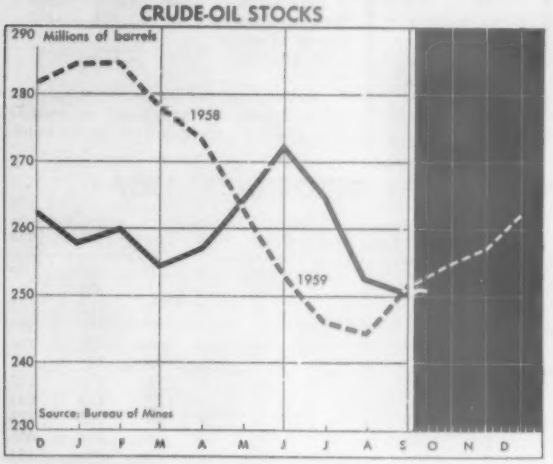
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	1	1	0	0	0	0	11,478	78	62	0	0	0	0	0	20	24
Arizona	1	0	0	0	1	0	6,917	23	.....	1	0	0	0	1	21	.....
Arkansas	14	11	0	0	3	0	38,865	669	623	3	1	0	0	2	118	132
California	26	10	0	0	11	5	138,204	1,206	1,230	7	0	0	0	7	317	296
Colorado	21	10	0	1	10	0	106,011	612	660	9	1	0	0	8	358	386
Illinois	35	12	0	0	22	1	74,951	1,796	1,803	7	1	0	0	6	295	361
Indiana	11	4	0	0	7	0	12,936	647	637	5	1	0	0	4	222	235
Kansas	91	49	0	6	36	0	316,468	3,171	3,045	30	4	0	4	22	819	644
Kentucky	49	25	0	1	23	0	54,244	1,926	952	11	1	0	0	10	232	125
Louisiana	79	36	4	4	34	1	576,768	2,978	2,749	16	1	0	0	15	404	405
North	34	14	0	4	16	0	111,983	1,155	1,035	5	0	0	0	5	178	171
South	39	19	3	0	17	0	410,640	1,500	1,367	11	1	0	0	10	211	211
Offshore	6	3	1	0	1	1	54,145	323	347	0	0	0	0	0	15	23
Michigan	0	0	0	0	0	0	0	498	344	0	0	0	0	0	129	112
Mississippi	7	1	0	0	6	0	64,888	500	305	3	0	0	0	3	223	140
Montana	3	0	0	0	3	0	10,492	248	264	3	0	0	0	3	82	107
Nebraska	13	9	0	0	4	0	79,616	717	575	4	2	0	0	2	307	267
New Mexico	41	23	0	9	9	0	208,410	1,650	1,553	5	1	0	0	4	193	213
West	14	4	0	8	2	0	67,362	738	761	1	0	0	0	1	51	88
East	27	19	0	1	7	0	141,048	912	792	4	1	0	0	3	142	125
New York	0	0	0	0	0	0	0	217	438	0	0	0	0	0	19	39
North Dakota	0	0	0	0	0	0	0	361	370	0	0	0	0	0	67	118
Ohio	16	7	0	4	5	0	40,928	802	821	0	0	0	0	0	23	12
Oklahoma	73	32	1	4	36	0	331,644	4,473	5,073	15	1	0	2	12	689	695
Pennsylvania	49	12	0	29	3	5	165,482	441	473	0	0	0	0	0	10	16
South Dakota	2	0	0	0	2	0	10,038	14	.....	2	0	0	0	2	6	.....
Texas	352	180	24	27	115	6	1,412,907	14,998	14,324	71	11	1	0	59	2,827	2,932
Dist. 1	29	12	2	1	14	0	82,749	865	795	9	0	0	0	9	259	317
Dist. 2	12	2	3	1	6	0	78,910	627	603	3	0	0	0	3	180	160
Dist. 3	26	7	5	1	13	0	155,016	960	1,014	8	0	1	0	7	193	227
Dist. 4	13	6	3	2	2	0	55,742	1,069	926	0	0	0	0	0	263	278
East	40	25	4	0	10	1	122,406	1,012	979	7	2	0	0	5	194	272
Dist. 7-B	45	17	0	1	27	0	129,354	2,054	1,962	15	1	0	0	14	554	542
West	96	66	2	12	15	1	490,279	4,553	4,097	16	6	0	0	10	625	573
Dist. 9	60	31	0	0	25	4	148,775	2,815	2,897	9	1	0	0	8	471	465
Dist. 10	31	14	5	9	3	0	149,676	1,043	1,051	4	1	0	0	3	88	98
Utah	7	3	0	0	4	0	42,703	244	302	2	0	0	0	2	65	73
West Virginia	12	1	0	11	0	0	28,966	623	594	1	0	0	1	0	26	14
Wyoming	14	5	0	2	7	0	71,783	765	604	6	0	0	0	6	267	190
Misc. (Wash)	1	0	0	0	1	0	6,650	80	78	1	0	0	0	1	53	68
Total U. S.	918	431	29	98	342	18	3,811,349	39,737	37,879	202	25	1	7	169	7,792	7,604
Previous week	988	440	19	102	362	65	4,108,282	.....	.....	196	17	0	8	171	.....	.....
Cum. 1959	39,737	19,723	982	2,969	14,945	1,118	165,525,087	.....	.....	7,792	716	92	251	6,733	.....	.....
Cum. 1958	37,879	18,477	905	2,879	14,603	1,015	156,208,746	.....	.....	7,604	742	130	205	6,527	.....	.....
Western Canada	30	16	0	2	9	3	158,408	1,934	1,955	7	1	0	0	6	543	520

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	10-10-59	10-3-59	10-11-58
Pennsylvania	2,583	2,625	2,837
Other Appalachian	2,131	2,108	1,867
Illinois, Indiana, Michigan	9,551	9,342	9,407
Nebraska and North Dakota	3,060	2,926	3,150
Kansas	9,787	9,988	9,147
Oklahoma	14,323	13,906	16,873
Arkansas	2,082	2,190	1,879
Louisiana	17,989	17,852	16,974
North	3,272	3,465	2,911
South	14,717	14,387	14,063
Mississippi, Alabama, Florida	2,434	2,264	2,534
New Mexico	7,758	7,824	7,980
Texas	108,777	109,688	106,304
East Texas	8,098	8,412	7,874
West Texas	50,943	49,690	52,213
Texas Gulf	19,109	19,368	19,840
Other Texas	30,627	32,218	26,377
Wyoming	16,399	16,140	13,622
Other Rocky Mountain	9,511	9,179	9,653
California	28,885	29,536	34,093
Foreign	†15,653	15,681	15,965
Total	250,923	251,249	252,285

*Bureau of Mines. †Includes 4,108,000 bbl. in California.

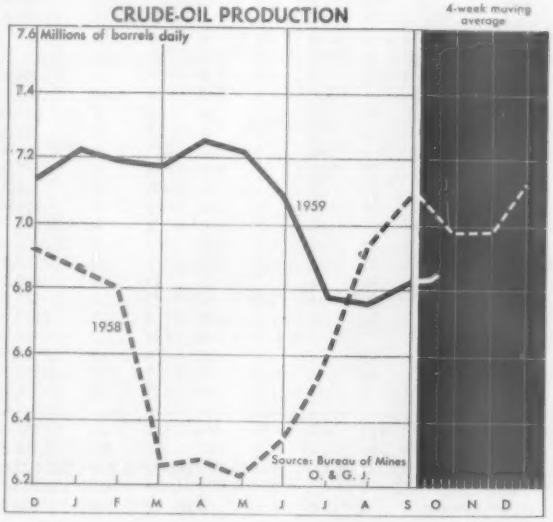
DAILY AVERAGE PRODUCTION FOR WEEK

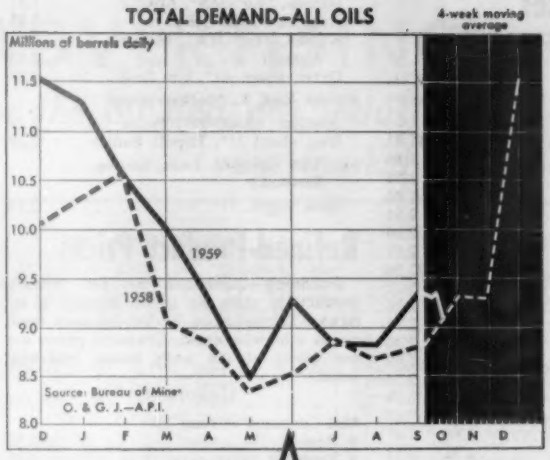
	October 17, 1959 Crude oil	Lease condensate	Total	October 10 total
Alabama	16,050	.....	16,050	16,000
Arkansas	52,200	300	52,500	52,500
California	842,200	.....	842,200	840,500
Colorado	126,600	.....	126,600	126,000
Eastern	43,000	.....	43,000	42,700
Florida	1,150	.....	1,150	1,150
Illinois	213,400	.....	213,400	209,300
Indiana	31,100	.....	31,100	31,400
Kansas	†323,080	.....	†323,080	†316,310
Kentucky	75,300	.....	75,300	84,400
Louisiana	912,000	107,350	1,019,350	1,019,500
North	108,000	5,100	113,100	113,250
South	804,000	102,250	906,250	906,250
Michigan	31,300	.....	31,300	31,300
Mississippi	137,630	4,100	141,730	141,730
Montana	82,400	.....	82,400	82,000
Nebraska	67,000	.....	67,000	66,400
Nevada	100	.....	100	100
New Mexico	287,200	5,200	292,400	292,400
North Dakota	51,200	.....	51,200	53,000
Oklahoma	†516,700	.....	†516,700	†495,850
Texas	2,410,000	75,600	2,485,600	2,485,600
Dist. 1	42,000	2,500	44,500	44,500
Dist. 2	102,000	7,700	109,700	109,700
Dist. 3	314,000	37,000	351,000	351,000
Dist. 4	170,000	8,600	178,600	178,600
Dist. 5	27,000	300	27,300	27,300
Dist. 6	103,000	9,000	112,000	112,000
East Texas field	130,000	.....	130,000	130,000
Dist. 7-B	132,000	170	132,170	132,170
Dist. 7-C	115,000	3,230	118,230	118,230
Dist. 8	968,000	4,500	972,500	972,500
Dist. 9	200,000	1,600	201,600	201,600
Dist. 10	107,000	1,000	108,000	108,000
Utah	108,400	.....	108,400	107,000
Wyoming	349,200	.....	349,200	348,000
Others	‡410	.....	‡410	‡360
Total U. S.	6,677,620	192,550	6,870,170	6,843,500
Change from prev. week up	.....	.....	26,670	.....
Canada	†539,700	.....	†539,700	†486,000

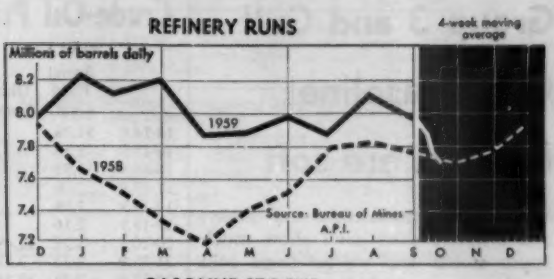
Total U. S. Prod.-Jan. 1-Oct. 17 ..... 2,044,759,190 bbl.
Same period last year (crude plus cond.) ..... *1,920,532,240 bbl.

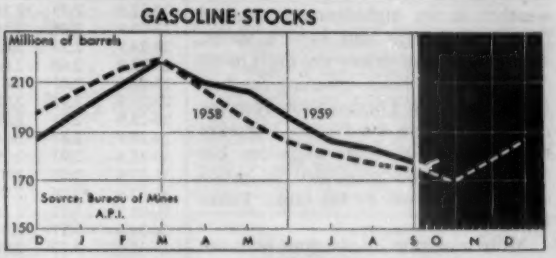
*Includes 45,786,580 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota and Washington.

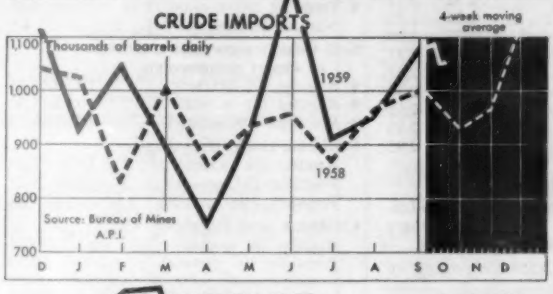
CRUDE-OIL PRODUCTION

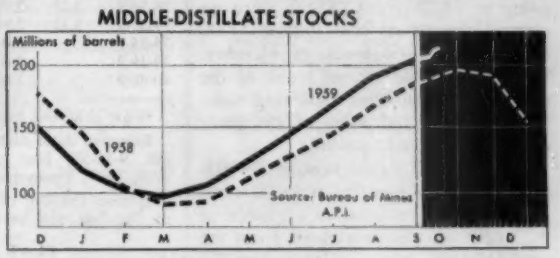


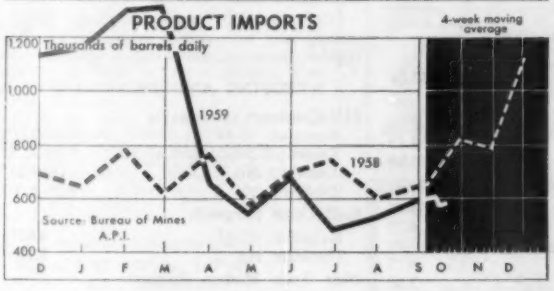


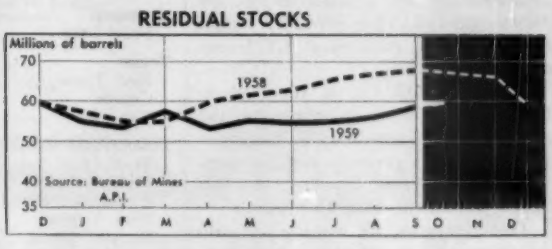












API REFINERY REPORT—OCTOBER 16, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1958: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,065	468.4	19.9	295.0	144.6	41,352	14,110	71,389	13,319	1,071	483.9	25.4	326.5	152.6
Appalachian:														
District 1	101	40.3	3.0	18.9	11.3	5,655	671	4,731	421	102	42.5	4.2	21.9	9.5
District 2	103	50.3	4.4	21.1	6.6	2,589	587	2,008	470	103	49.9	6.0	18.2	13.6
Ind., Ill., Ky.	1,449	747.7	68.7	314.6	128.8	31,523	7,444	29,700	6,539	1,363	702.7	59.7	287.6	142.0
Minn., Wis., Dak.	59	25.7	1.1	13.3	9.7	6,463	1,447	8,249	508	60	25.8	3.3	15.4	8.2
Okla., Kans., Mo.	725	406.6	17.6	186.1	26.0	17,640	1,509	12,803	962	667	373.4	11.6	163.2	24.7
Inland Texas	284	218.3	5.7	50.6	20.3	7,200	522	1,848	2,256	281	197.6	8.4	50.6	23.6
Tex. Gulf Coast	1,705	949.9	113.1	402.1	140.7	21,492	3,517	21,030	5,766	1,845	958.0	119.3	504.4	199.9
La. Gulf Coast	735	376.0	63.9	132.7	50.1	9,384	2,103	7,763	1,696	676	378.5	60.6	164.4	45.6
N. La. and Ark.	68	56.0	0.7	24.1	4.9	4,615	778	2,367	280	97	42.0	6.1	21.5	6.6
Rocky Mountain:														
New Mexico	27	19.0	0.7	4.9	3.6	851	50	186	47	23	12.1	0	4.6	2.4
Other Rky Mtn.	281	132.7	2.4	55.0	29.8	4,564	344	2,853	1,281	276	129.4	3.2	65.2	33.0
West Coast	1,157	525.0	6.9	166.7	280.6	25,404	358	15,063	26,054	1,136	504.2	7.6	174.9	297.4
Oct. 16, 1959	7,759	4,015.9	308.1	1,685.1	857.0	178,732	33,440	179,990	59,599	7,700	3,900.0	315.4	1,818.4	959.1
Oct. 9, 1959	7,688	3,946.4	281.6	1,801.7	791.0	177,613	32,814	177,670	59,040	.....	.....	.....	.....	.....
Oct. 17, 1958	7,613	3,713.0	350.3	1,814.9	976.9	170,361	31,520	161,341	68,020	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Group 3 and Gulf Coast gasoline Markets are soft

MOST gasoline markets are shaky, and distillate sales can't show much improvement until we get some cold weather in the high-demand areas of the north central and eastern states.

Spot gasoline prices on the Group 3 market have been softening for better than a week. Formal quotations for regular grade on the Group 3 market remain at 11.00 cents a gallon, but this price is being shaded in much of the area served by the Great Lakes Pipe Line.

More and more of the spot sales are going at 10.75 cents. There were no general reports of sales below 11.00 cents in the first week of October. Starting with the second week of the month there has been a growing number of reports of sales at discounts off the 11.00-cent posting.

Formal Gulf Coast posting for 92-octane gasoline remains at 11.00 cents a gallon, but material is available at 0.25 cent off. Some reports from the area indicate that an offer to buy for November lifting probably would bring out some gasoline at 0.375 cent off posting.

California Oil Co. is reported to have bought some gasoline on the Gulf Coast in recent weeks, but since that company's refinery will be operating again at near capacity, gasoline supply should be back to normal.

Distillate sales are waiting for cold weather. Almost all of the low temperatures so far this season have been in the Rocky Mountain district and on the west side of the north central area.

The result has been reports of slow movement from the Group 3 area and discounts on the East Coast. On the East Coast, some of the contracts with summer-fill discounts expired at the end of September. Oversupply has made it difficult to return to the full posted price.

Demand for residual fuel has been low for the past 3 months because of the steel strike, but the outlook for increased demand in December and the first quarter has tended to prevent big decreases in prices.

Some residual is reported to be moving from Oklahoma to the Gulf Coast.

This material is regular residual and nets the Mid-Continent refiner about $1.10 a barrel.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill§ Calif.	Okla-homa	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 9-12-59.

§Union Oil Co. of California posting up to 25c less per barrel.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.95
West Virginia	3.77
Buckeye Grade	3.62
Illinois Basin	3.00

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.86
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	10.75-11.25
★ Premium (99 octane)	13.50-14.00
Natural gasoline (26-70)	4.5
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.50-10.75
★ Regular (92 octane)	10.75-11.00
★ Premium (98 octane)	12.00-12.25
California (rack) (Los Angeles):	
Regular (88 octane)	11.65-12.25
Premium (94 octane)	12.65-13.25
Premium (100 octane)	14.15-14.50
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (97 octane)	12.00

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.25-9.50
Diesel oil (58 d.i. and above)	9.00-9.25
Distillate No. 1	9.00-9.25
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	8.625
Distillate No. 2	8.125
New York Harbor (barges):	
Kerosine 41-43	9.60
Distillate No. 2	9.10
Diesel fuel, 48-52 d.i.	9.40
Caribbean area (cargoes):	
Distillate No. 2	8.125

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.40-1.60
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.17-2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

Gulf-USNH, clear (ATRS—22.5%)	$2.21
Carib.-USNH, dirty (ATRS—60%)	1.10
Carib.-UK, clean (Scale —39%) (19s. 8d.)	2.78
PG-France, dirty (USMC —68%)	3.49

★Denotes change from previous week.

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FOR SALE: Oil, gas and Mineral rights, 2900 acres in Brokenstraw and Deerfield Townships, Warren County, Pennsylvania. Deep test now being made two miles south of this acreage. Write P. O. Box 255, Rouseville, Pa.

MUHLENBERG COUNTY, Kentucky. One well 8 bbl. daily and 56-acre lease. Four pays in field. Production on three sides. For sale all or part. Phone MI 5-6437—Clarksville, Tenn., Forest Ratchford.

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

WATER FLOOD Franklin County, Kansas. 640 acres, good engineering and best equipment, modern in every respect. Wonderful potential, good reason for selling. No brokers. Unless you are financially responsible do not reply. Box L-326, The Oil and Gas Journal, Tulsa, Oklahoma.

Drilling Blocks in Grayson County Ky. On Rough River Fault a part of Illinois Basin. See me if you want to drill, promote or buy acreage. Frank H. Patterson Phone 4-1738 (Mrs. Mu 3-7433) 424 Locust St. Owensboro Kentucky.

FOR SALE: Old established Independent Oil Company, Hutchinson County, Texas. Ten leases in local area covering 1,456 acres on which there are 72 producing wells and 71 undrilled locations. All leases except three carry full seven-eighths working interest with no depth limitations. Oil Production of 830 bbls. per day and over three MMcf of Casinghead gas per day. Sealed bids to be opened November 7, 1959. For further information write or call Travelers Oil Company, Box 1680, Borger, Texas; Phone BR 3-7371.

LIGHT CRUDE OR CONDENSATE. Interested in contracting for 12,000 plus barrels per month API 50° or 68°, F.O.B. field into our transports. Small volume, scattered production acceptable. Within 250 mile radius Fort Worth necessary. All replies held in strict confidence. Box L-543, The Oil and Gas Journal, Tulsa, Oklahoma.

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Gerald T. Shipman, Short Hills, N. J.
DRexel 6-2215

Discovery wells

(Continued from page 147)

and extension Southwest Helen Gohlke field.

WEST TEXAS

Andrews County: Carl Johnstone, Jr., 2 University "Blk. 11," Sec. 34, Blk. 11, University Lands Sur., 15 miles southwest of Andrews. IP 204 BOPD, 20/64-in. choke, 43.7°, GOR 923:1, TP 275 psi., Fusselman 8,052-8,108 ft. TD 8,159 ft., ground elevation 3,279 ft.

Texaco Inc. 20-H Parker, Sec. 15, Blk. A-46, PSL Sur. Dual completion, new pay discovery in the Ellenburger. IP 457 BOPD, 22/64-in. choke, Strawn 9,351-9,589 ft.; IP 441 BOPD, 34/64-in. choke, 45°, GOR 593:1, TP 100 psi., Ellenburger 12,349-59 ft. TD 12,422 ft., elevation 3,204 ft.

Gaines County: Redfern & Herd 1 Elliston, Sec. 32, Blk. G, C&MRR Sur., 6 miles southeast of Seagraves. IP 10,700 M.c.f. of gas, Yates 3,330-62, 3,376-94 ft. TD 5,599 ft., elevation 3,295 ft.

Glasscock County: Shell Oil Co. 1 Currie, Sec. 24, Blk. 34, T1S, T&P Sur., 6 miles north of Garden City. Old well plugged back for Queen discovery in Carter field. IPP 27 BOPD, 31°, pay 1,900-2,100 ft. TD 10,621 ft., PB 2,250 ft.

Irion County: Woodward, Turner & Webb 1 Byler, Tweedy Sur. 6147, 8 miles east of Mertzon. IP 145 BOPD, 5/16-in. choke, 43°, GOR 833:1, TP 280 psi., Canyon 6,224-52 ft. TD 7,410 ft., ground elevation 2,229 ft.

Runnels County: Anderson & Graham 5 Emmie Michaelis, GC&SF Survey, 1½ miles northeast of Hatchell, new pay in Andergram field. IP 82 BOPD, 36/64-in. choke, 41°, GOR 1,310:1, TP 120 psi., Upper Gardner 4,068-72 ft. TD 4,125 ft., elevation 1,734 ft.

Texas Hanover Oil Co. 1 Lila Currie 2, Sec. 347, Juan Hernandez Sur., A-242, 9 miles west of Ballinger. IP 1,360 M.c.f. of gas, Odom lime 4,580-85 ft. TD 4,712 ft.

Sutton County: Texaco Inc. 1 C. Allison, Sec. 61, Blk. K, GH&SA Sur., 13 miles northeast of Sonora. IPP 14 BOPD, 38°, GOR 1,343:1, Ellenburger 6,408-14 ft. TD 6,466 ft., ground elevation 2,366 ft.

NEW MEXICO

Lea County: Texas Pacific Coal & Oil Co. 3-A State, A/C 3, 10-23s-36e, deep test in Jalmat field. IP 12 BOPD, plus 108 BW, 20/64-in. choke, 36°, GOR 172,600:1, TP 975 psi., Queen sand 3,652-77 ft. TD 8,500 ft., PB 3,803 ft.

Kansas' Permian push continues advance

Additional success is reported in the fast-moving Council Grove Permian gas hunt in southwestern Kansas.

Hugoton Production Co. completed its 2 Larrabee in C SE 23-31s-39w, 12 miles southwest of Zionville in Stevens County, for 16,533 M.c.f.d. from perforations at 2,704 to 2,906 ft. Location is 4½ miles northwest of closest Council Grove pay at West Center field.

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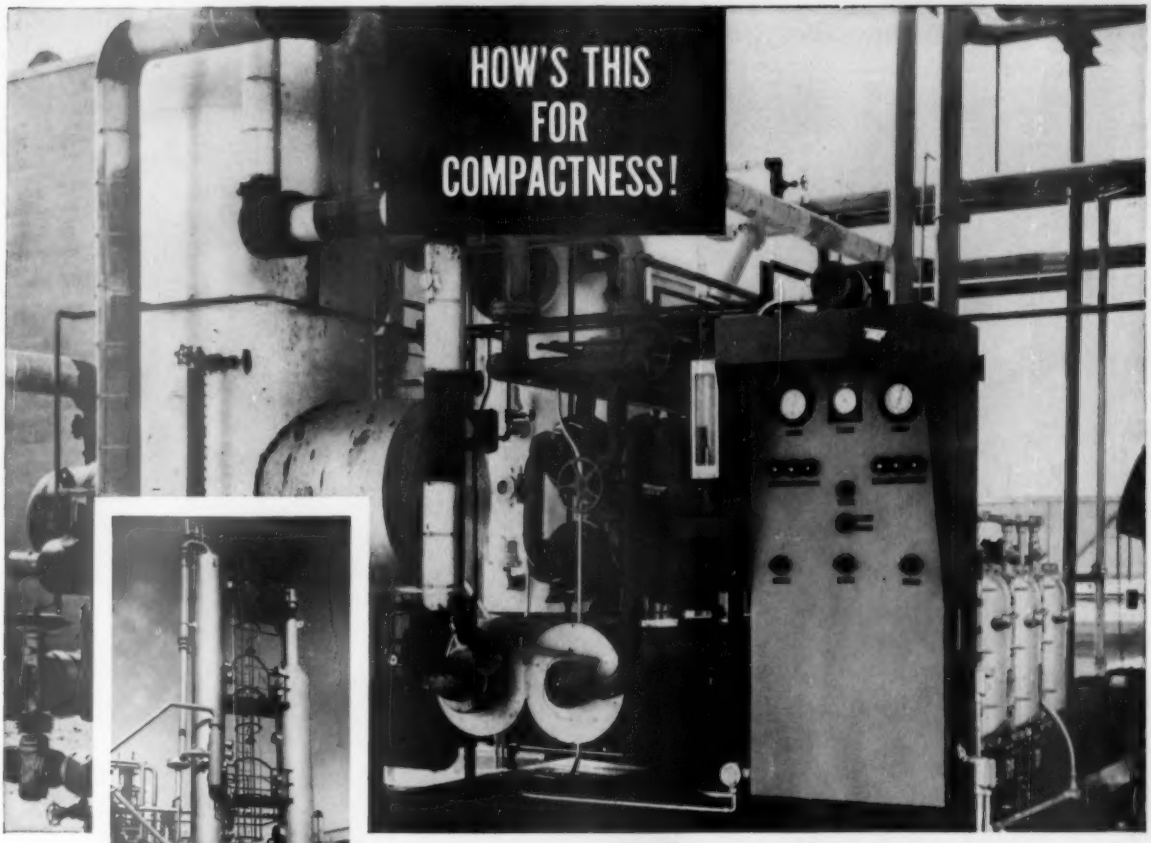

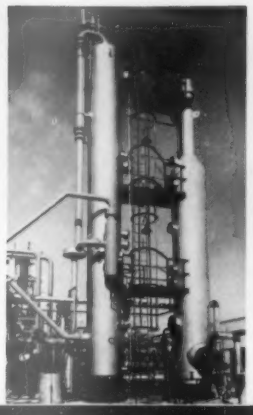

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